

---

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google<sup>TM</sup> books

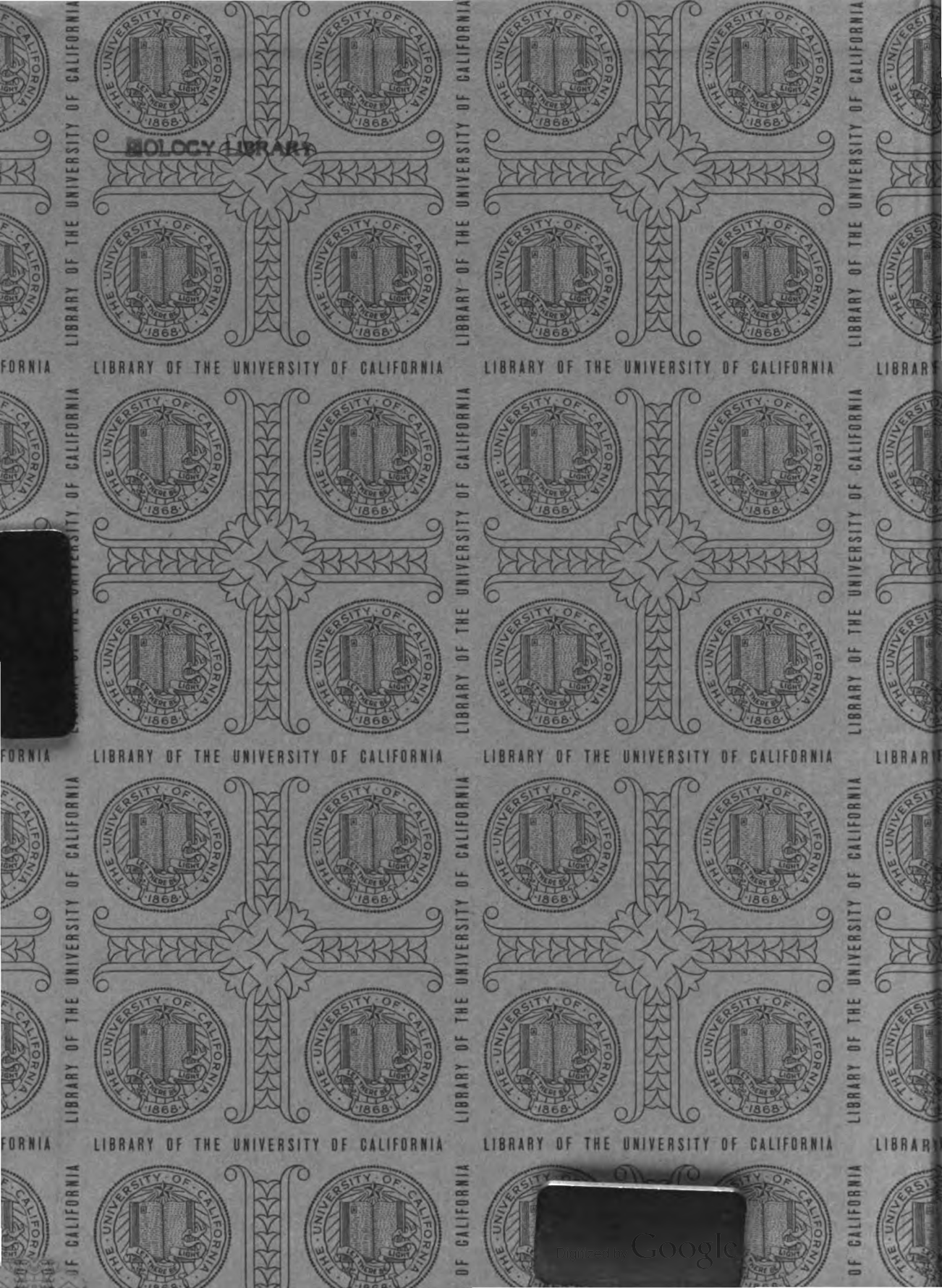
<https://books.google.com>



UC-NRLF



B 4 424 973



BIOLOGY LIBRARY





LIBRARY OF THE UNIVERSITY OF CALIFORNIA



LIBRARY OF THE UNIVERSITY OF CALIFORNIA



UNIVERSITY OF CALIFORNIA

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

LIBRARY OF THE UNIVERSITY



LIBRARY OF THE UNIVERSITY OF CALIFORNIA



LIBRARY OF THE UNIVERSITY OF CALIFORNIA



UNIVERSITY OF CALIFORNIA

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

LIBRARY OF THE UNIVERSITY



LIBRARY OF THE UNIVERSITY OF CALIFORNIA



LIBRARY OF THE UNIVERSITY OF CALIFORNIA



UNIVERSITY OF CALIFORNIA

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

LIBRARY OF THE UNIVERSITY



LIBRARY OF THE UNIVERSITY OF CALIFORNIA



LIBRARY OF THE UNIVERSITY OF CALIFORNIA



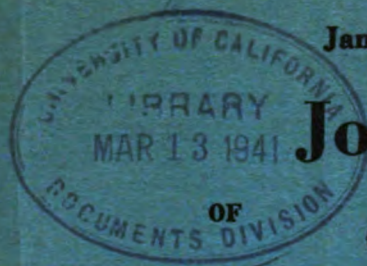




No. 1.

January, 1941.

Vol. LXXVI.



Journal

V.76 R31

THE

67  
Breed.

Royal Army



Medical Corps

ISSUED

MONTHLY

Sub fa  
# 4+6

EDITOR

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTANT EDITOR

LIEUTENANT-COLONEL H. A. SANDIFORD, M.C., R.A.M.C.

MANAGER

LIEUTENANT-COLONEL W. J. F. CRAIG, R.A.M.C.

Catalogue for BioL Lib

Jan - May  
1941

# CONTENTS

## ORIGINAL COMMUNICATIONS.

PAGE

The Use of Plasma. By Colonel L. E. H. WHITBY, C.V.O., M.C., M.D., F.R.C.P.	1
Army Blood Transfusion Service Technique for the Filtration of Blood Plasma. By Quartermaster-Sergeant S. R. M. BUSHBY and Colonel L. E. H. WHITBY, C.V.O., M.C., M.D., F.R.C.P.	4
Gunshot Wounds of the Head in 1940. By HUGH CAIRNS, Colonel, Army Medical Service	12
Scabies. By Lieutenant F. L. LYDON, R.A.M.C.	23
Anti-Scatter Treatments for Window Glass	30
Notes on the Geology of the Quaternary Deposits of the "Pianura Padana." By P. R. McNAUGHT, M.D., Ch.B., D.Sc. Glasg., D.P.H. Cambridge, Medical Officer of Health, City of York	34

## EDITORIAL.

Nutritive Value of White Flour	41
--------------------------------	----

## CLINICAL AND OTHER NOTES.

PAGE

A Card Index System for Office Records in General Hospitals. By Lieutenant-Colonel R. A. HEPPLE, M.C., R.A.M.C.	43
A Case of Loose Bodies in Both Elbow Joints. By Lieutenant-Colonel J. C. ANDERSON, R.A.M.C.	45
Rheumatic Manifestations following Rubella. By Major IAN MURRAY, R.A.M.C.	48
Bermuda Volunteer Rifle Corps Fly Trap. By Major J. E. BROOKS, R.A.M.C.	49
An Unusual Case of Von Recklinghausen's Disease. By Captain R. J. MCGILL, I.M.S.	51
A Note on the Storage of Blankets and Stretchers. By Captain (Q.M.) F. DAVIS, R.A.M.C.	52
Vaccination—Treatment of One of the Later Complications. By Lieutenant C. HACKNEY, R.A.M.C.	54
CURRENT LITERATURE	54
REVIEWS	59
R.A.M.C. COMFORTS GUILD	63
NOTICES	64

JOHN BALE & STAPLES LIMITED

83-91 GREAT TITCHFIELD STREET LONDON W 1

Price Two Shillings and Sixpence net

Digitized by Google



## LOCAL ANÆSTHESIA IN SURGICAL PRACTICE

Novocain has been in general use in all the chief Hospitals for over 20 years. Conclusive proof of its efficacy is now to be found in every standard work on Local Anæsthesia.

For every type of MAJOR AND MINOR SURGICAL OPERATION.

Hypodermic Tablets "A" for Minor Surgical Operations.

" " "B" for Block Anæsthesia.

" " "C" for Spinal Anæsthesia.

" " "E" for Dental Extractions.

Solutions in Cartridges, Ampoules and Stoppered or Rubber Capped Bottles.

We invite applications for reports and details of major and minor operations with Novocain.

*Does not come under the restrictions of the Dangerous Drugs Act.*

# NOVOCAIN

*Brand Ethocain  
Hydrochloride*

**The Original Preparation.**

English Trade Mark No. 276477 (1908).

As supplied to the R.A.M.C., War Office, Admiralty, Crown Agents for the Colonies, &c.

*Sold under Agreement*

**The SACCHARIN CORPORATION, Ltd., 72 Oxford St., London, W.1.**

Telegrams: "SACARINO, RATH., LONDON."

Telephone: MUSEUM 8096.

Australian Agents—J. L. BROWN & Co., 123, William Street, Melbourne, C.1.

FOR MALE NURSES IN THE  
R.A.M.C. AND OTHER FORCES

## PRACTICAL NURSING

By Colonel E. M. HASSARD, A.M.S. (retd.) and A. R. HASSARD

This book is primarily intended for orderlies, not only during their service, but when they leave it and take up, as no doubt many of them do, male nursing in civil life.

5/- post free

**JOHN BALE & STAPLES LIMITED**  
83-91 Great Titchfield Street W 1

5/- post free

# CHRISTOPHER & CO. LTD.

**WINE MERCHANTS,**

**43, PALL MALL, LONDON, S.W. 1**

**MILITARY MESSES SPECIALLY CATERED FOR.**

**FOR OVER 30 YEARS SUPPLIERS TO R.A.M.C. HEADQUARTERS MESS**

Telephone: WHITEHALL 5557/8.

When writing advertisers please mention "Journal of the R.A.M.C."



Authors are alone responsible for the statements  
made and the opinions expressed in their papers.

K21  
G7  
v. 76

BIOLOGY  
LIBRARY

Journal  
of the  
**Royal Army Medical Corps.**

**Original Communications.**

**THE USE OF PLASMA.**

BY COLONEL L. E. H. WHITBY, C.V.O., M.C., M.D., F.R.C.P.

*From the Army Blood Transfusion Service.*

A WOUNDED man who has suffered severe blood loss inevitably exhibits the symptoms and signs of shock and will die from this condition unless the loss is adequately restored. The most serious aspect of secondary shock, progressive circulatory failure, indicated by progressive reduction in blood-pressure, is due not so much to loss of red corpuscles, that is the oxygen-carrying factor of blood, as to loss of blood volume. This renders the circulation inefficient and leads finally to irreparable vascular changes and so to interference with tissue metabolism from which recovery is not possible. Most transfusions of war therefore aim at restoring blood volume, whereas in civil practice transfusions are more commonly performed in order to increase oxygen-carrying power for which purpose fresh whole blood is obviously the fluid of choice. In war the fundamental requirement for the transfused fluid is that it shall remain in the circulation; it must not be rapidly eliminated in the way in which saline and other crystalloid solutions are. A number of fluids other than blood fulfil this requirement and of these human blood plasma and human blood-serum have many advantages. When a large area of tissue is severely damaged, fluid is also lost from the circulation by plasma exudation into the injured area. This is shown by local tissue swelling and is most prominent in the case of burns, in which condition the plasma loss into burned area may be as much as two or three litres. There may, therefore, be a serious reduction in blood-volume due entirely to plasma loss and this is, indeed, even more serious than

blood loss because the blood becomes viscid by reason of concentration of the red cell elements ; this increases the embarrassment to the circulation. In such cases it is clearly better to restore blood-volume with plasma, the fluid which has been lost, than to do so with whole blood. Successful restoration of blood-volume can only be accomplished by the transfusion of an amount of fluid approximately equal to that lost. It is necessary, therefore, to be prepared to transfuse amounts of from two to six pints, the amount being governed solely by the beneficial effect on the blood-pressure, unless facilities exist for the simple laboratory examinations which allow blood-volume to be calculated (Bushby, Kekwick and Whitby, 1940).

The value of plasma for resuscitation has been amply proved in recent campaigns and in the treatment of air raid casualties. It has been found that restoration of circulatory efficiency automatically increases the efficiency of such red cell elements as remain and so either reduces the amount of whole blood that needs also to be transfused or does away with the necessity altogether. Nevertheless, as a rough rule, it may be stated that, with the exception of burns, with those who require a transfusion of three pints of fluid, one of the pints should be whole blood. At the outset of the war large "banks" of stored blood were established. This blood, if properly cared for, can be kept for three to four weeks ; after this time the corpuscles become so fragile that they are rapidly destroyed in the circulation of the recipient. Experience now shows that blood plasma can be used instead of blood for the primary resuscitation of most casualties. This is not to say that blood has been discarded, for the good clinician will mix blood with plasma in the appropriate case and will, indeed, often use blood alone because it is very much less laborious to collect and prepare.

In order to prepare a pint of plasma, it is necessary to have two and a half pints of blood, which is then subjected to an intricate processing that renders it agglutinin free, fat free and sterile, as described in the article on page 4. But plasma has the advantage that it keeps for at least six months and experience will probably show that this period is very much longer. Nor does it need to be refrigerated accurately and is in fact much better preserved if merely kept cool and in the dark.

The main technical difficulty in the processing of plasma is to prevent post-filtration clotting. The final fluid should properly be gin clear and clot free. But clots themselves do not render the plasma unfit for transfusion though the clot may cause obstruction of the outlet unless the bottle is first shaken in order to aerate the clot and make it float. As a rough clinical rule it may be said that clear plasma is always safe but plasma which is diffusely turbid (as distinct from a definite clot) may be unsafe by reason of infection. Not all turbidity is due to bacterial growth, because fine fibrinous deposits are often diffuse. Nevertheless it is safer not to risk the administration of any bottle which is obviously turbid.

There is often confusion as to the difference between serum and plasma and the two fluids are sometimes wrongly regarded as identical. Serum

differs from plasma in that the former contains no fibrinogen ; the more clot that is present in plasma the less fibrinogen does it contain, and the more closely does it approximate to serum.

Army Transfusion Service plasma contains sodium citrate as the anti-coagulant. In a pint bottle there are approximately 400 c.c. of plasma and 140 c.c. of 3 per cent sodium citrate. This last is rapidly excreted by the recipient and in this way is a protection against a transfusion reaction in that the urine is rendered alkaline. The chance of such reactions is extremely small because the plasma has been rendered agglutinin free. It is as well to bear in mind, however, that when a pint bottle is transfused the amount of protein fluid, that is fluid which remains in the circulation, is not a pint, but is no more than 400 c.c. Only the 400 c.c. can be considered capable of restoring blood-volume permanently.

This short description is designed to bring forward certain facts about fluid citrated plasma. It in no way attempts to weigh the merits of fluid plasma as opposed to whole blood, fresh or stored, fluid serum, dried serum or dried plasma, though animal experiments (Buttle, Kekwick and Schweitzer 1940) suggest that of all transfusion fluids alternative to blood, fluid plasma approximates most closely in value to that of blood itself for purposes of resuscitation.

#### REFERENCES.

- BUSHBY, S. R. M., KEKWICK, A., and WHITBY, L. E. H. (1940). *Lancet*, **ii**, 540.  
BUTTLE, G. A. H., KEKWICK, A., and SCHWEITZER, A. (1940). *Lancet*, **ii**, 507.
-



# ARMY BLOOD TRANSFUSION SERVICE TECHNIQUE FOR THE FILTRATION OF BLOOD PLASMA.

BY QUARTERMASTER-SERJEANT S. R. M. BUSHBY

AND

COLONEL L. E. H. WHITBY, *C.V.O., M.C., M.D., F.R.C.P.,*

*The Army Blood Transfusion Service.*

## PRELIMINARY TREATMENT.

*For Removal of Fat.*—Plasma, having been separated from freshly collected blood and filtered without more than a few hours' delay, is at first crystal clear. But within a few days it becomes opalescent, this being due to the separation of minute globules of fat. This opalescence can be avoided



FIG. 1.—Pooling of A and B blood.

if the blood is kept at a temperature of 4° to 6° C. for one day, and is thereafter warmed to room temperature for six to eight hours before pooling.

*For Removal of Agglutinins.*—Pooled blood is stood for not less than two hours so that the cells may absorb agglutinins. Blood from A and B donors is pooled into large 2½ gallon bottles with a proportion of B to A of not less than 1 : 16 (fig. 1). Provided the ratio of B to A is not less than this figure most samples contain no agglutinins; a few may contain agglutinins of a titre less than 1 : 8 which is immaterial. The plasma from stored group O blood removed by syphoning may be added to the pool. The lower the concentration of cells in the blood the better will an Alfa-Laval centrifuge (*vide infra*) separate the plasma.

#### SEPARATION OF PLASMA FROM CELLS BY ALFA-LAVAL CENTRIFUGE.

All parts of the Alfa-Laval centrifuge which come into contact with the blood must be sterilized. The delivery outlet is fitted with rubber tubing so that the plasma can be conducted into sterile bottles without opportunity for aerial contamination. The "yield controlling screw" which is fitted at the plasma outlet must be set so that the interfacial layer of plasma and cells is at the minimum distance from the bottom of the cones; with the screw in this position the blocking of the machine with leucocytes is reduced to a minimum.

If separation is begun by running the blood into the empty spinning centrifuge the first yield of plasma contains much hæmoglobin; this can be avoided by filling the centrifuge first with saline which is afterwards displaced with blood.

If the plasma becomes tinted with hæmoglobin the machine must be taken to pieces, washed with running hot water, re-assembled, filled with saline and the whole process begun again. The Alfa-Laval centrifuge will separate hæmoglobin-free plasma from blood up to forty-eight hours old, but older blood yields plasma tinted with hæmoglobin, presumably from mechanical action upon fragile cells.

#### CLARIFICATION.

Fat is removed from the plasma by passage through well-packed cotton filters. These are prepared from "Perfecta" pulp which is broken into small pieces and soaked in water in enamel bowls. The soaked pulp is autoclaved at 15 pounds pressure for thirty minutes; this process not only sterilizes but helps to make the texture of the pulp homogenous. The filters are prepared in bottomless Winchester quart bottles, the necks of which are filled with large pebbles (fig. 2); they are sterilized by steaming. Before use the filter is washed through with sterile saline.

The plasma is clarified by suction through these filters into sterile bottles. Each filter will deal with approximately 6 litres after which it becomes saturated. On standing the plasma may become opalescent

# ARMY BLOOD TRANSFUSION SERVICE TECHNIQUE FOR THE FILTRATION OF BLOOD PLASMA.

BY QUARTERMASTER-SERJEANT S. R. M. BUSHBY

AND

COLONEL L. E. H. WHITBY, *C.V.O., M.C., M.D., F.R.C.P.,*

*The Army Blood Transfusion Service.*

## PRELIMINARY TREATMENT.

*For Removal of Fat.*—Plasma, having been separated from freshly collected blood and filtered without more than a few hours' delay, is at first crystal clear. But within a few days it becomes opalescent, this being due to the separation of minute globules of fat. This opalescence can be avoided



FIG. 1.—Pooling of A and B blood.



if the blood is kept at a temperature of 4° to 6° C. for one day, and is thereafter warmed to room temperature for six to eight hours before pooling.

*For Removal of Agglutinins.*—Pooled blood is stood for not less than two hours so that the cells may absorb agglutinins. Blood from A and B donors is pooled into large 2½ gallon bottles with a proportion of B to A of not less than 1 : 16 (fig. 1). Provided the ratio of B to A is not less than this figure most samples contain no agglutinins; a few may contain agglutinins of a titre less than 1 : 8 which is immaterial. The plasma from stored group O blood removed by syphoning may be added to the pool. The lower the concentration of cells in the blood the better will an Alfa-Laval centrifuge (*vide infra*) separate the plasma.

#### SEPARATION OF PLASMA FROM CELLS BY ALFA-LAVAL CENTRIFUGE.

All parts of the Alfa-Laval centrifuge which come into contact with the blood must be sterilized. The delivery outlet is fitted with rubber tubing so that the plasma can be conducted into sterile bottles without opportunity for aerial contamination. The "yield controlling screw" which is fitted at the plasma outlet must be set so that the interfacial layer of plasma and cells is at the minimum distance from the bottom of the cones; with the screw in this position the blocking of the machine with leucocytes is reduced to a minimum.

If separation is begun by running the blood into the empty spinning centrifuge the first yield of plasma contains much hæmoglobin; this can be avoided by filling the centrifuge first with saline which is afterwards displaced with blood.

If the plasma becomes tinted with hæmoglobin the machine must be taken to pieces, washed with running hot water, re-assembled, filled with saline and the whole process begun again. The Alfa-Laval centrifuge will separate hæmoglobin-free plasma from blood up to forty-eight hours old, but older blood yields plasma tinted with hæmoglobin, presumably from mechanical action upon fragile cells.

#### CLARIFICATION.

Fat is removed from the plasma by passage through well-packed cotton filters. These are prepared from "Perfecta" pulp which is broken into small pieces and soaked in water in enamel bowls. The soaked pulp is autoclaved at 15 pounds pressure for thirty minutes; this process not only sterilizes but helps to make the texture of the pulp homogenous. The filters are prepared in bottomless Winchester quart bottles, the necks of which are filled with large pebbles (fig. 2); they are sterilized by steaming. Before use the filter is washed through with sterile saline.

The plasma is clarified by suction through these filters into sterile bottles. Each filter will deal with approximately 6 litres after which it becomes saturated. On standing the plasma may become opalescent

from incomplete separation of the fat during the pre-clarification stages ; this opalescence is removed by the sterilizing filtration process (*vide infra*).

#### STERILIZATION.

This is accomplished by passage through asbestos pads in a Seitz pilot filter.

Asbestos pads possess the property of adsorbing the fibrinogen from the



FIG. 2.—Clarification through cotton-pulp filter.

first portion of filtered plasma. When using eight 20 cm. pads the first 500 c.c. of filtrate contains no fibrinogen whilst the next 1,000 c.c. has a very poor content.

The asbestos also removes prothrombin from approximately 10 litres. the amount varying slightly with the batch. Although this 10 litres of filtered plasma contains neither prothrombin nor ionizable calcium most

of it subsequently clots on storage. The rate of clotting is the reverse of the order of filtration. Thus clotting begins in the last bottles within twenty-four hours, but may not occur in the earlier ones for fourteen days or longer or even not at all. If sufficient plasma is passed through the pads (about 15 litres) clotting occurs instantaneously even in the filter. The delayed clotting in filtered plasma occurs more rapidly at 4° to 6° C. than at room temperature.

Clotting in the later batches of filtered plasma is probably due to traces of thrombin, formed on the filtering pad from the activation of adsorbed prothrombin by a metallic ion, probably magnesium, which is able to function in the same way as calcium, and which is known to be present in asbestos in considerable amount.

The prothrombin adsorbed on to the asbestos pad can be removed from the pads by alkali. If, therefore, the pads are washed with N/30 sodium hydroxide at the stage immediately before thrombin begins to appear in the plasma, the delayed clotting of filtered plasma can be prevented.

This is the principle followed in the detailed technique described below.

#### STERILIZATION AND ASSEMBLY OF APPARATUS.

(The letters in the text refer to fig. 3.)

*Filter.*—The Seitz pilot filter is sterilized by steam under pressure. The outlet cock (O), to which is attached a piece of rubber tubing 2 feet long (D), is wrapped in calico and sterilized separately in the autoclave. After sterilization it is connected to the unsterilized filter with the valve closed. Steam is passed into the filter until it escapes freely from all opened valves, whereupon all are closed except the two draining valves and these are so adjusted that any condensed steam can slowly escape. The pressure is allowed to rise to 5 pounds per square inch and is maintained for ten minutes. The outlet valve is then opened and steam is allowed slowly to escape from the attached tubing, the end of which has already been covered with calico. The inlet valve is adjusted so that the pressure is maintained at 5 pounds per square inch for a further ten minutes, after which time the steam is turned off, the outlet valve closed and the apparatus allowed to cool.

*Pooling and Bottling Apparatus.*—For convenience the distributing apparatus is sterilized separately in the autoclave. This apparatus consists of a 4-litre reservoir bottle (C) with a wired-in rubber bung through which is passed two  $\frac{1}{4}$ -inch glass tubes. One of these glass tubes reaches to the bottom of the bottle, the other is a short length. The short length is attached to a piece of rubber tubing that leads to an efficient wool filter (W). The long length terminates as a T piece, one arm of which is connected by rubber tubing to two  $\frac{1}{4}$ -inch glass tubing delivery pipettes (E and E<sub>1</sub>), protected by hoods (F and F<sub>1</sub>) made from bottomless Winchester quart bottles. Before use the sterility of these hoods is maintained by large plugs of wool covered with calico held in position by rubber bands.





When assembling, the distributing apparatus is joined to the filter by inserting the open glass end (M) into the rubber tubing (D) on the outlet valve with all aseptic precautions. As a final precaution the union is immersed in boiling water for fifteen minutes. Five screw clamps are fitted in the positions 3, 4, 5, 6, 7, as illustrated.

*Positive Pressure Vessel and Alkali or Saline Reservoir.*—The plasma is contained in a tin-lined copper pressure chamber (A), which connects by rubber tubing to the inlet valve (I) of the filter. None of the apparatus to the left of the filter (*see fig. 3*) is subjected to full systematic sterilization, but is kept scrupulously clean and is assembled after thorough rinsing with hot water. Sterilization of this part of the apparatus is unnecessary because all the plasma therefrom is subjected to filtration. Immediately in front of the filter inlet valve (I) a T piece is inserted. This provides the inlet for the alkali and the saline wherewith the filter pads are washed between successive filtrations; it connects by rubber tubing to a long piece of glass tube (N) that passes through a two holed rubber bung into a Winchester quart bottle (B). A short piece of glass tubing (P) passes through the other hole of the bung and connects to the pump. Two screw clamps are fitted in the positions 1 and 2 as illustrated.

*Blood Transfusion Bottles.*—Pint blood transfusion bottles in which the filtered plasma is collected are plugged with wool covered with gauze and the plug as well as the neck of the bottle are then covered with cellophane in order to prevent dust settling on the rim. These are autoclaved. These bottles are finally sealed with rubber bungs which undergo boiling in a water bath at the time of filtration; this water bath contains distilled water with 1 per cent phenol. The bungs are kept covered with the boiling solution and any loss of fluid due to evaporation must be replaced with the phenol solution. The phenol ensures that the potential space between the rubber bung and the neck of the bottle is filled with a film of antiseptic which lessens the risk of bacteria or fungi growing downwards into the plasma.

#### TECHNIQUE.

*Premises and Staff.*—The filtration and bottling of plasma is carried out in a draught- and dust-free room. The floor of the room is kept moist with antiseptic during the whole time it is in use. The atmosphere should be sprayed with a suitable aerial disinfectant such as Euginol Carbinol.

A staff of four is required; all must wear sterile gowns and masks and sterilize their hands with Dettol. Changing of clothes, coats for gowns, etc., within the room is forbidden.

Operator No. 1 takes charge of the plasma container and is responsible for changing bottles of saline and caustic soda and for washing the filter pads between-whiles. Operators Nos. 2 and 3 are responsible for bottling; Operator No. 4 is responsible for placing the bungs in the bottles (*fig. 4*).

*Filtration—First Batch.*—The copper container (A) is filled with plasma and, with screw clamps Nos. 2, 3, 5, and 7 closed, Operator No. 1 applies a pressure of 7 pounds per square inch to the container thereby forcing the plasma through the filter into the reservoir bottle (C). For this first batch, 3 pints only are allowed to run into the reservoir, whereupon clamp No. 1 is closed and clamp No. 2 opened, pressure now being applied through the saline and alkali container (B), which at this stage must be empty. By applying pressure in this manner the residue of plasma in the filter is forced into the reservoir bottle; and pressure is maintained until air begins to appear from the filter. The reservoir now contains 4 pints, which is the largest amount of plasma that can be filtered during this first stage without subsequent clotting.

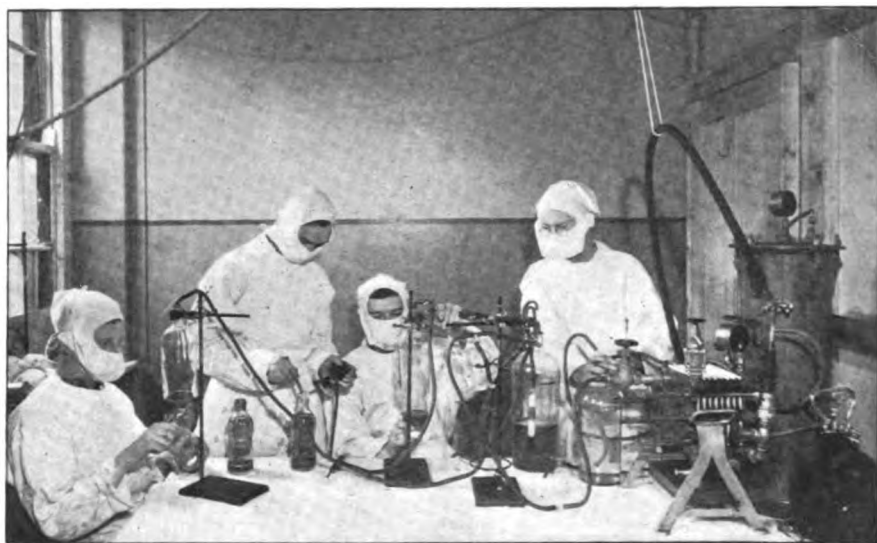


FIG. 4.—Filtration and bottling team at work.

*Bottling.*—Clamps Nos. 4 and 6 are closed whilst No. 7 is opened so that the plasma can now be distributed into bottles. Operators Nos. 3 and 4 each work a hooded pipette and each pipette is used alternately. A pressure of 2 pounds per square inch is applied to the reservoir to force the plasma into the pipette. A bottle is placed very carefully under a hood and when removing the plugs care is taken not to touch the rim of the bottle with the fingers; nor must any plasma be allowed to foul the neck of the bottle during the filling process. The flow is controlled by spring clips and filling is so timed that one of the clips is always open. As each bottle is filled it is taken by Operator No. 4 who carefully avoids slopping the plasma on to the neck of the bottle and who keeps the mouth of the bottle covered with a Bunsen flame from the time it leaves the hood until the bung is pushed into position. Bungs are removed with forceps from the boiling water bath

containing 1 per cent phenol in distilled water which has previously been described. The top of the bung and the neck of the bottle are swabbed with a watery solution containing 10 per cent glycerine and 2 per cent phenol. The top of the bottle is then covered with a viscap which has previously been soaked for one hour in a watery solution of 1 per cent phenol and 2 per cent glycerine.

*Washing the Filter with Alkali.*—Whilst the filtered plasma is being distributed the filter is being washed with alkali and afterwards cleared with saline before continuing filtration. Clamp No. 3 is opened and 2 litres of N/30 caustic soda, contained in one Winchester bottle (B), are forced through the filter and allowed to run to waste. The Winchester of alkali is then changed for a Winchester of normal saline which passes through the filter and so displaces the alkali. Another Winchester of saline is then connected and after a total of 3 litres has passed, clamps Nos. 4 and 5 are opened thus washing away any alkali which has collected in front of clamp No. 4. The 4 litres of saline are followed by plasma by closing clamp No. 2 and opening No. 1, but the filtrate continues to run to waste until plasma appears. Clamp No. 6 is then opened whilst clamps Nos. 3, 5 and 7 are closed.

*Filtration—Subsequent Batches.*—Eight pints of plasma may now be filtered before the filter is again washed. It is important to shake the reservoir periodically in order to ensure that the plasma is homogeneous. At least 150 pints of plasma can be filtered through the eight plates of the filter, but washing must be carried out after every eighth pint.

*Sterility Tests.*—Sterility tests should be made by running 20 c.c. of plasma into 100 c.c. of 1 per cent glucose broth contained in a pint blood transfusion bottle. Six tests should be made during the filtration of 150 pints. The cultures should be incubated for three days. This medium will grow both aerobes and anaerobes.

The plasma should be stored in a warm room for at least seven days before being used. This serves as an incubation period for any casual contaminant, the growth of which will become visible to the naked eye. The detection of bacteria by this macroscopic method is not easy, but plasma which remains crystal clear can safely be assumed to be sterile. Sterile plasma can become opalescent from minute droplets of fat which have not been removed in the early cooling and warming process; this opalescence can simulate the growth of organisms such as *B. subtilis*. Fibrin occasionally forms as granules and this closely resembles the growths of staphylococcus, streptococcus and diphtheroid bacilli. Most of these pseudo-growths can be recognized with practice, but where there is any doubt it is better to make microscopic examinations of the suspected samples, rejecting the contaminated ones and refiltering the others.

*Yield.*—The plasma yield by this process is a little under 50 per cent of the original blood volume when 100 c.c. of anti-coagulant is added to 440 c.c. of blood. The theoretical yield is 60 per cent.

Four workers take about four hours to filter and bottle 150 pints.

**Filtration—First Batch.** The copper and cloth screw clamps Nos. 2, 3, 5, and 6 are closed and a pressure of 7 pounds per square inch is applied to plasma through the filter into the reservoir. Only 4 pints only are allowed to run into the reservoir. The clamp No. 2 is closed and clamp No. 2 opened, pressure saline and alkali container (B), which at this time is applying pressure in this manner the residual plasma is forced into the reservoir bottle, and pressure is applied from the filter. The reservoir now contains the largest amount of plasma that can be filtered without subsequent clotting.



Fig. 4. Filtration and bottling team.

**Bottling.** Clamps Nos. 4 and 6 are closed whilst Nos. 2 and 3 are open, the plasma can now be distributed into bottles. One person works with a hooded pipette and each pipette is used at a pressure of 7 pounds per square inch is applied to the reservoir into the pipette. A bottle is placed very carefully in the pipette, the plug is carefully taken not to touch the tip of the pipette, nor must any plasma be allowed to flow during the filling process. The filling is continued until it is ascertained that one of the clamps is closed. It is then closed by Operator No. 2 and the pipette is removed from the neck of the bottle and the bottle is removed from the pipette. The bottle is then placed in the reservoir.

consciousness at the time of injury; they are effects. The usual story was that the patient fell and then got to his feet, to continue his post. Some of these patients lost consciousness, e.g., after walking 150 yards, or at a certain dosage of  $\frac{1}{4}$  to  $\frac{1}{2}$  grain; but the loss of consciousness, as seen in civil cases, was absent. It did occur, but was only momentary. It is not the clinical syndrome of concussion. It may be explained by the high incidence of cases without initial loss of consciousness (3 of 6) and 5 of the 6 cases with only minor degrees of penetrating injury (2 frontal, 3 parietal). In the majority of the scalp wounds the intracranial damage was illustrated by the following cases.

Case 1. (No. 9700), received a scalp wound in the right temple. The right hand became numb and useless. The left hand was not affected. During the next 24 hours he often dropped things from his hands. He developed a right parietal subdural abscess and later considerable motor and sensory deficit. The abscess was opened and drained. The patient recovered and returned to duty.

Case 2. In this case brain damage is in the focal area of the scalp wound in which there was no intracranial damage, as in the following case.

Case 3. (No. 9709), received a long scalp wound in the right temple. He did not lose consciousness, but there was increasing intensity. Four days later there was except diminished tendon reflexes. A uniformly blood-stained fluid exuded from the wound. Ten days after the injury the patient died (No. 9710). The patient made a complete recovery.

It is concluded that loss of consciousness may frequently be a misleading guide in the assessment of delayed brain damage. It is important to recognize that loss of consciousness is not producing it, especially in the following cases.

Case 4. (No. 9711), loss of consciousness after a scalp wound. The patient was an unreliable witness. He was injured as well as by a missile, and the injury was incomplete. The patient made a complete recovery.

## GUNSHOT WOUNDS OF THE HEAD IN 1940.

BY HUGH CAIRNS.<sup>1</sup>*Temporary Colonel, Army Medical Service.**(Nuffield Professor of Surgery, University of Oxford.)*

In a recent series of gunshot wounds of the head certain points emerged which call for comment at the present time. The classification followed is that of Cushing (1918), but with the small number of cases involved it has not been necessary to use all of Cushing's types. In addition, the cases have been subdivided into two main groups : non-penetrating or penetrating, depending on the integrity or otherwise of the dura mater. In gunshot wounds of the head the condition of the dura is the most important item of information required by those responsible for treatment and assessment of the amount of disability. If the dura is penetrated the liability to intracranial infection is greatly increased and the risk of subsequent epilepsy is probably also enhanced.

TABLE I.—GUNSHOT WOUNDS OF THE HEAD.

Variety	No. of Cases	Complications	No. of Cases
<b>NON-PENETRATING</b>			
Scalp wound .. .. .	9	Local osteomyelitis .. .. .	1
		Local osteomyelitis and subdural abscess .. .. .	1
		Local osteomyelitis and brain abscess .. .. .	1*
Local fracture with intact dura .. .. .	6	Local osteomyelitis .. .. .	1
		Abscess around F.B. in scalp .. .. .	1
<b>PENETRATING</b>			
Depressed fracture with dural tear .. .. .	1	Subdural hæmatoma and brain fungus .. .. .	1
Penetration of brain with fragments of bone .. .. .	6	Brain ærocele and fungus .. .. .	1
		Brain fungus .. .. .	2
		Purulent leptomeningitis .. .. .	1*
Penetration of brain with fragments of bone and metal .. .. .	6	Brain ærocele and fungus .. .. .	1
		Purulent leptomeningitis .. .. .	1*
Cranio-cerebro-orbital .. .. .	1	Brain fungus and abscess .. .. .	1
Total .. .. .	29		

\* Deaths.

## THE EFFECT OF GUNSHOT WOUNDS ON CONSCIOUSNESS.

This series of cases shows some striking differences from the closed head injuries of civil life. The first of these is the frequency with which consciousness is retained at the moment of impact. Seventeen of the twenty-

<sup>1</sup> From the Military Hospital (Head Injuries), Oxford.



nine patients did not lose consciousness at the time of injury; they remembered and could describe its effects. The usual story was that the patient was knocked over by the impact and then got to his feet, to continue fighting, or to walk back to the aid post. Some of these patients lost consciousness fairly soon after injury, e.g. after walking 150 yards, or at a later stage, especially if given morphia in dosage of  $\frac{1}{4}$  to  $\frac{1}{3}$  grain; but the typical unconsciousness of concussion, as seen in civil cases, was absent. In a further 6 cases unconsciousness did occur, but was only momentary. Thus, 23 of 29 patients did not have the clinical syndrome of concussion.

The absence of concussion is not to be explained by the high incidence of non-penetrating wounds. The cases without initial loss of consciousness include 3 penetrating frontal lobe injuries; and 5 of the 6 cases with only fleeting loss of consciousness were cases of penetrating injury (2 frontal, 2 occipital, and 1 temporal). Moreover, in the majority of the scalp wounds there is distinct evidence of brain damage, as illustrated by the following case:—

*Case 1.*—Guardsman J. D. (Serial No. 46) received a scalp wound in the right parietal region, and immediately his left arm and hand became numb and useless. He did not lose consciousness, and his leg was not affected. During the next week his upper limb gradually recovered, though he often dropped things from his hand. Then the wound suppurated and he developed a right parietal subdural abscess, with return of brachial monoplegia and later considerable motor and sensory weakness of the left leg. The subdural abscess was opened and drained twenty-nine days after injury. The patient recovered and returned to duty four months after his injury.

In many scalp wounds the evidence for brain damage is in the focal signs such as those described above. In cases of scalp wound in which there are no focal signs there may still be intracranial damage, as in the following case:—

*Case 2.*—B. McN., a civilian, aged 25 (R.I. No. 9709), received a long scalp wound of the vertex from bullet or bomb fragment. He did not lose consciousness, but suffered from frontal headache of gradually increasing intensity. Four hours after injury there were no neurological signs except diminished tendon jerks, but lumbar puncture showed slightly but uniformly blood-stained fluid under an initial pressure of 200 mm. water. Thirteen days after the injury the cerebrospinal fluid was normal (initial pressure 100 mm.). The patient made a complete recovery.

In spite of the absence of concussion effect, consciousness may frequently be lost at a later stage, from a variety of causes. The assessment of delayed unconsciousness may be difficult, and it is important to recognize that extreme fatigue may play a considerable part in producing it, especially when combined with routine injections of morphia.

Of the six patients with a story of prolonged unconsciousness after injury (duration between eight hours and several days), one was an unreliable witness, another was probably hit by falling masonry as well as by a missile, and a third was dysphasic and his field card notes were incomplete. The remaining cases were as follows:—

*Case 3.*—Pte. H. R. (Serial No. 226). Gunshot wound of left external auditory meatus. A fragment of metal penetrated and lodged in the vermis of the cerebellum. His last memory was of carrying a message for his platoon commander, until he awoke in hospital in England. He was unconscious for several days.

*Case 4.*—Pte. D. G. D. (Serial No. 34). Tangential wound of right temple, the missile shattering the right side of the frontal bone and right orbit, with exposure of a large area of the right frontal lobe. The patient was unconscious for five days.

*Case 5.*—Pte. A. D. (Serial No. 49). Left parieto-occipital gunshot wound, with indriven bone fragments. Blood in the left middle ear (with temporary deafness on recovery of consciousness). This patient was unconscious for twelve hours after the injury and had further lapses of consciousness during the next few days.

It is difficult to draw conclusions from such a small and to some extent selected group of cases, especially in the absence of accurate notes on the state of consciousness during the first few days after injury. But it is remarkable that cases of foreign body penetrating the frontal and parietal lobes showed no loss of consciousness, whereas a foreign body passing through the petrous bone into the cerebellum (*Case 3*) produced unconsciousness which lasted several days. Is the unconsciousness (concussion) of closed head injuries of civil life due to commotion of the whole brain, or to damage to some part of it, such as the brain stem? A carefully documented study of the state of consciousness after penetrating gunshot wounds may throw some light on this problem. The case notes should record the degree and duration of the unconsciousness from the earliest possible moment after injury. Does the patient respond to questions in a normal or drowsy manner? Or does he only respond to loud shouts, or to painful stimuli?

#### FOCAL SYMPTOMS.

Another respect in which gunshot wounds differ from closed head injuries is in the frequency with which they are followed by symptoms of a focal character. The following cases illustrate this point.

*Case 6.*—Sergeant J. H. (Serial No. 157) was struck in the right occipital region by a shell fragment. The bone was fractured and fragments of it penetrated the right occipital lobe. He does not recall the noise of the shell-burst, but remembers feeling himself moving, and he was thrown two and a half yards by the explosion. He saw a moving mass of red and black colours. For a few seconds after striking the ground he was unable to move. He rapidly regained movement, first of his right arm and then of his whole body, and he was able to speak and get up. He found that he was completely blind and he had to be led back to the command post seventy yards away. Here he was able to make out the light of a paraffin lamp, but nothing more. By the time he had reached the Field Ambulance one hour later he was still unable to distinguish more than light or dark. On the following day he was operated on; the skin wound was excised and sutured, after presenting bone fragments and pulped brain had been removed.

On the second day after injury some sight returned in his right upper visual fields. On the fourth day after injury he could make out faces and other objects to his right side, but these were still blurred. On the tenth day he could read printed words on his field card and could see clearly in his right fields and not at

all in his left fields. During the next eight weeks there was gradual improvement of the left upper visual fields and his ability to read became almost normal.

When seen by us about ten weeks after the injury he had a steep-edged congruous left lower quadrantic homonymous hemianopia, and his visual acuity was 6/5 in each eye. There were no other neurological signs. X-rays showed fragments of bone in the right occipital lobe.

After the injury this patient had deafness, tinnitus, and some discharge from the right ear which gradually passed off completely.

This case illustrates the well-known fact that focal damage to the brain after gunshot wound is by no means solely due to the penetrating foreign body. Bone fragments entered the right occipital lobe, breaking up the upper half of the right geniculo-calcarine pathway with a resultant left lower quadrantic hemianopia of permanent character. The initial symptoms, however, were those of complete blindness. During the following days vision recovered in an orderly manner: first in the right upper fields, then in the right lower fields, and finally, after some weeks, in the left upper fields. The permanent damage was of very limited extent and corresponded to the track of the foreign body. The temporary damage affected a wider, but, if we may judge from the clinical evidence, fairly sharply defined zone; and the severity of this completely reversible process varied inversely with the distance from the site of injury.

The focal damage that can be produced without penetration of the brain is illustrated by the following case:—

*Case 7.*—Guardsman A. C. (Serial No. 78) was struck by a bullet which made a large hole in the back of his steel helmet and produced a scalp wound and fissured fracture in the left occipital region, without any depression or penetration. He did not lose consciousness, but his sight became misty. He was able to walk back unaided about one mile, but his sight then failed so that he could only perceive light. Thereafter his sight gradually recovered, but he could not read small print until three weeks after the injury. Two months after the injury his fields and acuity were normal and he showed no neurological signs.

Cases of this type were reported during the 1914-18 war by Hine (1918), who was able to trace the recovery from homonymous hemianopia by day-to-day perimetry. It is interesting to note that in Case 7 the focal damage was gradual in onset, and this has been observed in other cases. It suggests that the cause is cerebral or meningeal hæmorrhage of limited extent. Examples of focal damage are seen affecting parts of the brain other than the occipital region.

*Case 8.*—Lt. G. H. M. (R.I. No. 9311) was hit by a shell fragment which pierced his steel helmet in the right Rolandic region and fractured the bone without penetrating the dura. He was not unconscious and continued fighting for some time, although his face was paralysed on the left side and he was grossly dysarthric. Three days after injury the missile was removed from the skull. Two months later the wound was reopened on account of persistent discharge, and five loose fragments of bone, most of them dead, were removed from between skull and dura. The left facial paralysis cleared up almost completely in the first three weeks, but traces of it were still distinctly visible four months after the injury.

The brain damage associated with scalp wounds was described by

Jefferson (1919) in an important paper at the end of the last war. Among 54 cases of scalp wound treated by him there were seventeen which showed signs of local contusion. "In the Rolandic region," he writes, "such signs can be traced through all grades of severity, from a local increase of the tendon jerks . . . up through slight aphasias, numbnesses, and pareses, finally culminating in definite palsies and Jacksonian fits." He points out that while it is easy to recognize the signs of contusion of the Rolandic and occipital regions it is extremely difficult to recognize contusion of silent areas. In some cases of focal brain injury an extradural or subdural clot is found, but in others inspection of the dura at operation has shown no evidence of abnormality, and it is probable that the primary pathological lesion is a bruising of a limited area of cortex and meninges below the site of the injury.

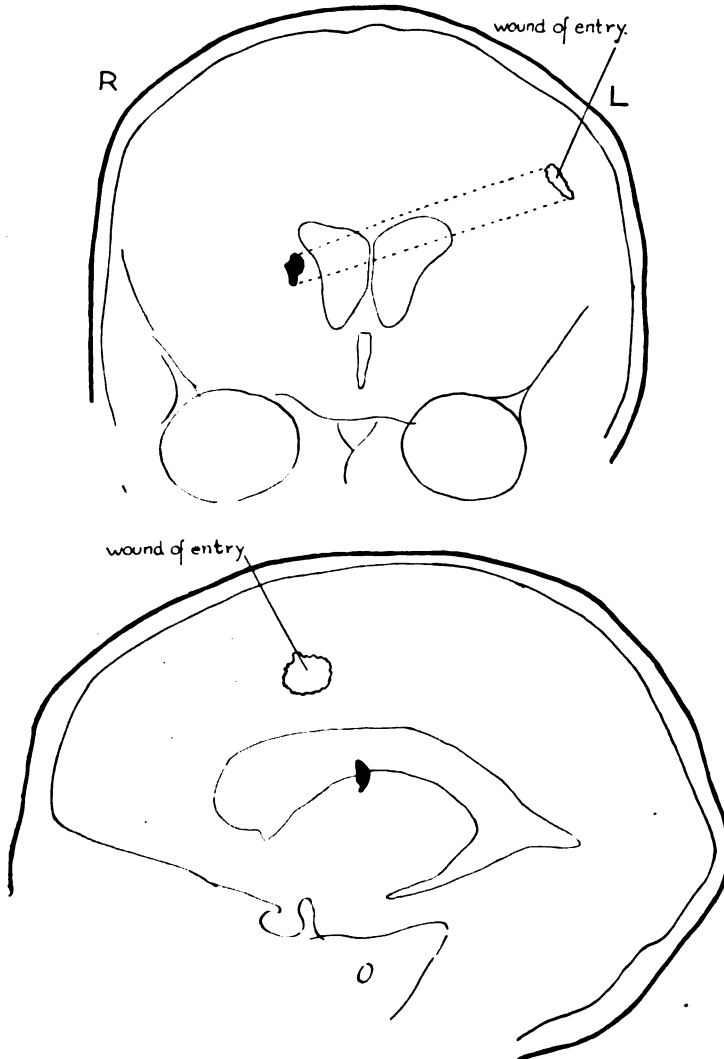
In the cases of this series there has been only one showing evidence of *contre-coup* damage, but Jefferson had four cases in which there was increase of tendon reflexes on the side of the scalp wound. In penetrating wounds, Dupérié (1916) reported homolateral signs, such as Jacksonian epilepsy and hemiplegia, and in necropsies he found *contre-coup* damage in 17 of 100 cases. This type of damage appears to be more common in the severe cases; of Dupérié's sixteen patients showing homolateral signs, seven died. In the one case of our series a patient with a deeply penetrating bomb wound of the left frontal lobe and right hemiplegia also had complete paralysis of the left lower limb. At operation the sagittal sinus was patent and there was no evidence of fracture, or of extradural or subdural hemorrhage over the right hemisphere.

#### SPONTANEOUS RECOVERY FROM FOCAL SYMPTOMS.

It appears that after gunshot wound there is a strong tendency for the focal signs to undergo spontaneous improvement or recovery. This applies to penetrating brain wounds as well as to wounds of the scalp and skull. The tendency may be more evident in this war than in earlier ones, owing to the relatively greater incidence of small metal fragments of high velocity.

*Case 9.—Penetrating bifrontal wound with retained metal foreign body. Severe aphasia. Spontaneous recovery.*—A. A. S., a civilian, aged 32 (Serial No. 69), was wounded by a bomb which landed about thirty feet from him. He received multiple superficial wounds, and one metal fragment, in size slightly less than 10 by 3 by 5 mm., penetrated the left side of the frontal bone and lodged in the right hemisphere (fig. 1). Subsequent encephalograms showed that its track through the brain crossed the lateral ventricle and the corpus callosum. A reliable observer states that after being hit the patient was still standing, hanging on to a support. He was able to walk with assistance; he was unable to speak, but made signs to indicate his wants. In the left frontal region there was a wound from which blood and brain tissue were protruding, and there was another superficial wound in the left parieto-occipital region. Five hours after injury the scalp wounds were excised, and blood-clot and bone fragments were removed from the superficial part of the penetrating frontal wound, but no attempt was made to remove the foreign body. The patient was given antitetanic serum and a course of sulphonamides.

When first seen by us about forty-eight hours after the injury the patient looked ill. Temperature 99.6° F., pulse-rate 106. He was conscious and understood simple commands, but motor speech was limited to a few single words, such as his surname. There was a leak of cerebrospinal fluid from the penetrating left frontal wound. He had considerable neck stiffness. There was slight weakness



FIGS. 1A and 1B, Case 9.—Transventricular penetrating G.S.W. with retained missile.

of the right side of the face, coarse tremor of both hands, more so on the right side, and slight weakness of toe movements on the right side. The abdominal reflexes were absent, both plantar reflexes were extensor in type, and he had retention of urine. As far as could be tested, sensory function was intact. Lumbar puncture yielded blood-stained fluid under an initial pressure of 190 mm.; total

protein 240 mgm. per cent ; red cells 27,800, white cells 520 per c.mm. ; polymorphonuclears 69 per cent, lymphocytes 31 per cent ; on culture a few colonies of *Staphylococcus albus*. X-rays showed a foreign body deep in the right frontal lobe (fig. 1).

The outlook in this case at first appeared grave, but within three days the improvement in speech, the cessation of the cerebrospinal leak from the wound and the diminution of the white cell count in the cerebrospinal fluid showed that our initial fears of fulminating meningitis were groundless. On the fourth day after injury voluntary control of micturition returned. By the fifth day he could read simple sentences slowly, and could understand simple commands, though his performance was inhibited very easily. He named most objects correctly but slowly. There was profound disturbance in writing and in calculation. Spontaneous speech was absent. There was also a notable absence of spontaneous and semi-automatic movements. He was confused as to time and place. For the first two weeks after the injury he could not recall any events since going to work on the morning of the injury.

Recovery progressed gradually and by four weeks after the injury he had recovered spontaneity in speech and action and had regained his mental faculties and confidence sufficiently to mix freely with the other patients. There was still difficulty in calculating and in reproducing what he had read. Spelling mistakes were frequent, especially in writing words out of context. Three and a half months after the injury there was further recovery, but he was still slow in calculating and still showed complete lack of understanding of mathematical symbols. He was, however, able to do light work in his garden.

In this case a small fragment entered the left frontal lobe just in front of the precentral gyrus, traversed both lateral ventricles, and lodged deep in the right hemisphere. There was at first a profound aphasia and also a leakage of cerebrospinal fluid from the wound. During the next four weeks there was a rapid and steady recovery of speech. Excision of the foreign body was out of the question owing to its depth, and the degree of spontaneous improvement was greater than had been expected.

Spontaneous recovery from hemianopia after penetration of the occipital lobe has already been noted in Case 6. In Cases 6 and 9 the residual functional damage was so slight that it could not have been bettered, and might easily have been aggravated, by early operation on the brain itself.

In the last war complete excision of the foreign body and its track of damaged brain was advocated and practised by experts on the following grounds :—

(1) To remove infective material which might otherwise produce meningitis or brain abscess, and dead brain tissue which would act as a favourable nidus for infection.

(2) To remove massive clot, extradural, subdural, or intracerebral, which might otherwise be fatal or produce further local brain damage.

(3) To diminish the liability to epilepsy occasioned by a retained foreign body.

The third point still remains to be proved, and in any case it does not necessarily bear on the question of early operation, for experience may show that, if foreign bodies are to be excised with the idea of diminishing the

liability to epilepsy, the best time for doing so is some weeks or months after the injury, when the wound of entry has healed.

The indications to remove clot and septic material remain valid, but it is clear that in a number of cases of this war, infection and massive clot do not develop; the changed conditions of warfare, chemotherapy, and, possibly, a relative decrease in size of high velocity missiles may contribute to this. Another indication also comes more clearly into the picture from recent experience, and that is that operations on brain wounds should not interfere with the spontaneous recovery of brain function that tends to occur in the days following injury. To judge from the literature of the last war, functional recovery after operation was often ascribed to operation. Our experience is sufficient to show that operation cannot cure focal signs which are the immediate sequel of penetrating wounds. The presence of such signs is not an indication for operation. It is only the signs of delayed onset and progressive course, due to clot, infection, or ærocele, which may be amenable to surgery.

Our experience of this war is so far small, particularly in regard to the more severe cases that tend to die in the first few days after being wounded, and no hard and fast rules for the treatment of penetrating brain wounds can yet be made. There is a suggestion, however, that a conservative policy may often be of value, particularly when the penetrating body is small; and there is an absolutely clear indication for the most careful observation of the development and course of the neurological signs in the first hours and days after the injury, together with thorough bacteriological studies of the wound.

Meanwhile the case for early operation to clean surgically the skin and superficial parts of every head wound, and where possible to do primary suture, remains clear. The sooner the wound is thoroughly cleaned of hair, dirt, bone splinters, and other foreign bodies down to the dural level, the less the risk of subsequent complications. Within the brain every manipulation potentially increases the brain damage and diminishes the extent of functional recovery, and therefore the utmost caution and gentleness must be exercised.

#### THE TREATMENT OF SCALP WOUNDS.

The experiences of this series show the extreme importance of surgical treatment of scalp wounds in the early stages. There were 15 cases of non-penetrating injury in 9 of which the laceration was confined to the scalp, while in the remaining 6 the skull also showed a small, usually linear, fracture. In 5 of these superficial wounds complications occurred, owing to inadequate treatment of the wound in the early stages; one patient died and another almost died from these complications (Table I).

This last case has already been mentioned (Case 1). The patient had a subdural abscess following a right parietal scalp wound, without fracture of the skull and without loss of consciousness. The wound was never excised. The notes state that on the day following injury the wound was "dirty, but showed no signs



of gross infection. Hypertonic saline dressings." Seven days after injury the wound was purulent and œdematous, and discharged pus containing a heavy growth of hæmolytic streptococcus; there was fever and malaise; sulphonamide treatment was now begun. Two weeks later the patient developed left hemiparesis, together with signs of meningitis (turbid cerebrospinal fluid which was sterile on culture). On admission to this hospital he was semicomatose, and showed early papilloedema, severe motor and sensory loss of the left arm, and, to a less extent, of the left leg. The cerebrospinal fluid contained 273 white cells per c.mm. At operation (Major P. B. Ascroft) beneath the granulating scalp wound a subdural abscess was found. It contained about 15 c.c. of pus from which streptococci were grown. After operation recovery was not absolutely complete, some slight sensory disability persisting in the left hand.

If, when this man reached hospital twenty-four hours after injury, his scalp wound had been excised, dusted with sulphonamides, and sutured, there is little doubt that the subdural abscess would not have developed.

The fatal case of scalp wound was as follows.

*Case 10.*—Pte. H. W. (Serial No. 58) was wounded in the right occipital region by a shell fragment on June 1, 1940. His helmet was impacted in his scalp and a scale of metal, 1 cm. in diameter, was embedded in the outer table of the skull, but there was no radiating fracture. He was not unconscious. The wound was excised and sutured on June 3. On June 8 he had an epileptic fit, and next day, for the first time, severe headaches, followed by progressive drowsiness. On admission to this hospital on June 11, there was an indolent scalp wound in the right occipital region. The patient was drowsy and showed complete left homonymous hemianopia and slight neck rigidity. The lumbar cerebrospinal fluid showed 3,200 white cells per c.mm. Sulphonamides were started. On June 14, the wound was opened and an extradural abscess was drained (pus contained *Staph. aureus* and streptococcus). The wound was excised and was dusted with pron-tosil powder. The patient improved for a time and his wound became cleaner, but after some days he became progressively more drowsy. On June 24, a right occipital abscess was drained through the old wound. Progress was not satisfactory and further loculi of pus were drained on July 6 and 9. The patient died on July 10. At post-mortem there was a collapsed abscess cavity and intense œdema of the white matter of the whole hemisphere.

That the excision of the wound on the second day after injury was rather perfunctory is shown by the fact that, at the second operation on June 14, a large flake of metal was found in the depths of the wound, embedded in the outer table of the skull. Even two weeks after injury, dusting of the wound with sulphonamides seemed to improve its condition, but this had no influence on the course of the patient's illness, for by that time he had an extensive cerebral abscess.

These cases suggest that in scalp wounds the risk of infection spreading through the intact skull and dura is greater after gunshot wound than after blunt injury. The high incidence of focal signs in gunshot wounds of the scalp indicates that the underlying zone of brain tissue is severely damaged, much more so than in scalp wounds due to blunt injury, and the resistance of this part of the brain to bacterial infection is correspondingly reduced. The skull at the site of impact is probably similarly affected, even though it may not be fractured.

In the other three cases the complications of scalp wounds were mild : in two there was local osteomyelitis, with persistent discharge from the wound until sequestra were removed ; in the third an abscess formed about two fragments of bomb-casing in the scalp. The frequency with which bone and brain became infected after gunshot wounds of the scalp and skull in this series indicates clearly the importance of careful operative treatment of what are apt to be regarded as trivial wounds. From the point of view of conserving man-power, the operation of cleaning and closing a scalp wound is much more important than the operation of removing a foreign body from the brain.

This simple operation is badly done by many surgeons. The most common mistake is to regard the operation as a minor one which may be performed in an aid-post or in a casualty room. The skin around the wound is shaved in a perfunctory manner and over a small area. If manipulation of the wound is painful, as when no anæsthetic is given, it is inevitable that the wound is not thoroughly explored and that it is cleaned and excised imperfectly.

Many surgeons still adhere to the method of closing the scalp by a single layer of widely spaced and tight sutures. By this procedure the blood supply of the wound edges is impaired and the sutures, which must be retained for several days, tend to cut through the skin. The result is an unsightly scar with ugly cross marks ; and often there is failure of primary union in part of the scar.

A standard method of scalp closure has now been adopted by surgeons accustomed to operating on the head. The main principle is to close the scalp in two layers with interrupted stitches of fine silk or thread (Commercial size, No. 28, black silk). The deep layer of sutures joins the thin but firm galea aponeurotica and the sutures are placed 1 cm. apart ; this approximates the scalp and takes all the tension. The sutures are cut close to their knots and are buried in the wound. The superficial stitches are then tied only tightly enough to bring the superficial edges of the wound together, and they can all be removed within forty-eight to seventy-two hours. The two layers are effectively hæmostatic, and it is not necessary to ligate scalp vessels. As the wound heals its scar is small and there are no cross marks ; on the forehead the scar should eventually be almost invisible. The buried stitches are not irritating even in a scalp wound that is slightly infected, and they do not give trouble if cut close to the knot. If silk or thread cannot be obtained, very fine catgut (00) may be used, though catgut produces more reaction in the tissues than does silk or thread.

Cleansing and excision of scalp wounds can only be carried out satisfactorily in an operating theatre and with good regional or general anæsthesia. The first step is to shave the scalp for a wide area (4 to 5 inches) around the wound. The wound edges are then opened and the depths are carefully examined for dirt, hairs, glass, bone and metal fragments. All of these should be meticulously removed, and, when it has been established that the dura is

intact, forcible irrigation with normal saline or Ringer's solution, or with a mild antiseptic such as proflavine sulphate (1:1000), will assist. Ingrained dirt cannot be removed except by excision; in scalp wounds the pericranium and loose connective tissue can be excised freely, but removal of the more superficial layers should be done as sparingly as possible, otherwise it may be difficult to get approximation without excessive tension. Not infrequently in gunshot wounds the missile destroys part of the skin, and then the cleaned excised scalp wound must be left open, or may be closed by a sliding graft. Light dusting of the wound with sulphonamides before closure is not irritating and is evidently a helpful measure against infection, particularly in those cases which arrive late at the C.C.S. and in which the wound edges are already reddened and œdematous. Scalp wounds can be excised up to three days and longer after injury. In the forward area, where no operating facilities are available, it is better to apply a moist flavine pack with firm bandage than to close the scalp imperfectly and without cleaning the depths of the wound.

#### SUMMARY.

A series of twenty-nine cases of recent gunshot wound of the head is described. The clinical syndrome of concussion is usually absent and careful study of those gunshot wounds in which immediate and sustained unconsciousness occurs may throw light on the mechanism of production of unconsciousness in blunt head injuries. In gunshot wounds, both those with dura intact (non-penetrating injuries) and with dura penetrated, focal neurological symptoms are more common than in blunt injury. These symptoms show a strong tendency to spontaneous recovery and this fact should be taken into account when considering the operative removal of foreign bodies and dead brain tissue from the brain itself. At this stage of the war no rules can be made about the operative treatment of intracerebral damage, though the case for early and thorough treatment of the parts of the wound superficial to the dura is clear enough.

Gunshot wounds of the scalp tend to be followed by infection of the underlying skull, subdural space, and brain unless they are thoroughly treated. The apparently trivial operation of cleaning and suturing a wound of the scalp is probably the most important neurosurgical operation of war.

Secretarial assistance with the case records of the hospital was provided by the Medical Research Council.

#### BIBLIOGRAPHY.

- CUSHING, H. (1918), *Brit. Journ. Surg.*, 5, 565.  
DUPÉRIÉ, H. (1916), *Rev. Neurol.*, 29, 616.  
HINE, M. L., (1918), *Brit. Journ. Ophthalm.*, 2, 12.  
JEFFERSON, G. (1919), *Brain*, 42, 93.

## SCABIES.

BY LIEUTENANT F. L. LYDON,  
*Royal Army Medical Corps.*

## (1) INTRODUCTION.

FROM the dermatological point of view valuable time is frequently lost in the training and efficiency of troops owing to infection by scabies, impetigo and epidermophytosis. Early diagnosis, rapid reliable treatment and preventive measures are necessary if satisfactory control is to be established.

The following paper, describing the results of 1,041 cases of scabies investigated and treated at the Skin Department, Connaught Hospital, will, I hope, contribute a little towards the elimination of scabies from the above-mentioned group, and it is hoped that the experience of the department in impetigo and epidermophytosis will be given at a later date.

## (2) DEFINITION.

Scabies is a contagious disease caused by infestation with a mite, the *Acarus* or *Sarcoptes scabiei*, characterized by great itching, worse at night, by the "burrows" made by the pregnant female parasite, red follicular papules, evidence of scratching and often of secondary infection with pyogenic cocci. The "burrow" is usually not more than a quarter of an inch in length and appears as a whitish or erythematous raised line with often a vesicle containing clear fluid at the blind end. The *Acarus* may in some cases be seen as a whitish speck just distal to the vesicle, and can be removed for microscopical examination with the end of a fine needle.

## (3) PARASITOLOGY.

The female *Acarus* is a minute white body about 0·3 millimetre in length, oval in shape, with four legs in front terminating in suckers, and four behind terminating in spines. The male is about half the size and is rarely found. The cycle from adult pregnant female may be represented thus:—

<i>Pregnant female.</i> (Burrows into deeper parts of horny layer.)			
	3 days.	moult.	moult.
Lays 40-50 eggs.....	Larva.....	1st Nymph.....	
Female adult.			
2nd Nymph.....	Impregnation.....	Adult pregnant female.	
Male adult.			

The development as far as the 2nd Nymph stage probably takes place in the original "burrow," scratching then takes place with the liberation of the adults thus facilitating spread to other areas. This cycle takes seven to thirteen days and it is stated that the adult female may under certain

## GUNSHOT WOUNDS OF THE HEAD IN 1940.

BY HUGH CAIRNS.<sup>1</sup>*Temporary Colonel, Army Medical Service.**(Nuffield Professor of Surgery, University of Oxford.)*

IN a recent series of gunshot wounds of the head certain points emerged which call for comment at the present time. The classification followed is that of Cushing (1918), but with the small number of cases involved it has not been necessary to use all of Cushing's types. In addition, the cases have been subdivided into two main groups : non-penetrating or penetrating, depending on the integrity or otherwise of the dura mater. In gunshot wounds of the head the condition of the dura is the most important item of information required by those responsible for treatment and assessment of the amount of disability. If the dura is penetrated the liability to intracranial infection is greatly increased and the risk of subsequent epilepsy is probably also enhanced.

TABLE I.—GUNSHOT WOUNDS OF THE HEAD.

Variety	No. of Cases	Complications	No. of Cases
NON-PENETRATING			
Scalp wound .. .. .	9	Local osteomyelitis .. .. .	1
		Local osteomyelitis and subdural abscess .. .. .	1
		Local osteomyelitis and brain abscess .. .. .	1*
Local fracture with intact dura .. .	6	Local osteomyelitis .. .. .	1
		Abscess around F.B. in scalp .. .. .	1
PENETRATING			
Depressed fracture with dural tear .. .	1	Subdural hæmatoma and brain fungus .. .. .	1
Penetration of brain with fragments of bone .. .. .	6	Brain ærocele and fungus .. .. .	1
		Brain fungus .. .. .	2
		Purulent leptomeningitis .. .. .	1*
Penetration of brain with fragments of bone and metal .. .. .	6	Brain ærocele and fungus .. .. .	1
		Purulent leptomeningitis .. .. .	1*
Cranio-cerebro-orbital .. .. .	1	Brain fungus and abscess .. .. .	1
Total .. .. .	29		

\* Deaths.

## THE EFFECT OF GUNSHOT WOUNDS ON CONSCIOUSNESS.

This series of cases shows some striking differences from the closed head injuries of civil life. The first of these is the frequency with which consciousness is retained at the moment of impact. Seventeen of the twenty-

<sup>1</sup> From the Military Hospital (Head Injuries), Oxford.

nine patients did not lose consciousness at the time of injury; they remembered and could describe its effects. The usual story was that the patient was knocked over by the impact and then got to his feet, to continue fighting, or to walk back to the aid post. Some of these patients lost consciousness fairly soon after injury, e.g. after walking 150 yards, or at a later stage, especially if given morphia in dosage of  $\frac{1}{4}$  to  $\frac{1}{3}$  grain; but the typical unconsciousness of concussion, as seen in civil cases, was absent. In a further 6 cases unconsciousness did occur, but was only momentary. Thus, 23 of 29 patients did not have the clinical syndrome of concussion.

The absence of concussion is not to be explained by the high incidence of non-penetrating wounds. The cases without initial loss of consciousness include 3 penetrating frontal lobe injuries; and 5 of the 6 cases with only fleeting loss of consciousness were cases of penetrating injury (2 frontal, 2 occipital, and 1 temporal). Moreover, in the majority of the scalp wounds there is distinct evidence of brain damage, as illustrated by the following case:—

*Case 1.*—Guardsman J. D. (Serial No. 46) received a scalp wound in the right parietal region, and immediately his left arm and hand became numb and useless. He did not lose consciousness, and his leg was not affected. During the next week his upper limb gradually recovered, though he often dropped things from his hand. Then the wound suppurated and he developed a right parietal subdural abscess, with return of brachial monoplegia and later considerable motor and sensory weakness of the left leg. The subdural abscess was opened and drained twenty-nine days after injury. The patient recovered and returned to duty four months after his injury.

In many scalp wounds the evidence for brain damage is in the focal signs such as those described above. In cases of scalp wound in which there are no focal signs there may still be intracranial damage, as in the following case:—

*Case 2.*—B. McN., a civilian, aged 25 (R.I. No. 9709), received a long scalp wound of the vertex from bullet or bomb fragment. He did not lose consciousness, but suffered from frontal headache of gradually increasing intensity. Four hours after injury there were no neurological signs except diminished tendon jerks, but lumbar puncture showed slightly but uniformly blood-stained fluid under an initial pressure of 200 mm. water. Thirteen days after the injury the cerebrospinal fluid was normal (initial pressure 100 mm.). The patient made a complete recovery.

In spite of the absence of concussion effect, consciousness may frequently be lost at a later stage, from a variety of causes. The assessment of delayed unconsciousness may be difficult, and it is important to recognize that extreme fatigue may play a considerable part in producing it, especially when combined with routine injections of morphia.

Of the six patients with a story of prolonged unconsciousness after injury (duration between eight hours and several days), one was an unreliable witness, another was probably hit by falling masonry as well as by a missile, and a third was dysphasic and his field card notes were incomplete. The remaining cases were as follows:—

*Case 3.*—Pte. H. R. (Serial No. 226). Gunshot wound of left external auditory meatus. A fragment of metal penetrated and lodged in the vermis of the cerebellum. His last memory was of carrying a message for his platoon commander, until he awoke in hospital in England. He was unconscious for several days.

*Case 4.*—Pte. D. G. D. (Serial No. 34). Tangential wound of right temple, the missile shattering the right side of the frontal bone and right orbit, with exposure of a large area of the right frontal lobe. The patient was unconscious for five days.

*Case 5.*—Pte. A. D. (Serial No. 49). Left parieto-occipital gunshot wound, with indriven bone fragments. Blood in the left middle ear (with temporary deafness on recovery of consciousness). This patient was unconscious for twelve hours after the injury and had further lapses of consciousness during the next few days.

It is difficult to draw conclusions from such a small and to some extent selected group of cases, especially in the absence of accurate notes on the state of consciousness during the first few days after injury. But it is remarkable that cases of foreign body penetrating the frontal and parietal lobes showed no loss of consciousness, whereas a foreign body passing through the petrous bone into the cerebellum (*Case 3*) produced unconsciousness which lasted several days. Is the unconsciousness (concussion) of closed head injuries of civil life due to commotion of the whole brain, or to damage to some part of it, such as the brain stem? A carefully documented study of the state of consciousness after penetrating gunshot wounds may throw some light on this problem. The case notes should record the degree and duration of the unconsciousness from the earliest possible moment after injury. Does the patient respond to questions in a normal or drowsy manner? Or does he only respond to loud shouts, or to painful stimuli?

#### FOCAL SYMPTOMS.

Another respect in which gunshot wounds differ from closed head injuries is in the frequency with which they are followed by symptoms of a focal character. The following cases illustrate this point.

*Case 6.*—Sergeant J. H. (Serial No. 157) was struck in the right occipital region by a shell fragment. The bone was fractured and fragments of it penetrated the right occipital lobe. He does not recall the noise of the shell-burst, but remembers feeling himself moving, and he was thrown two and a half yards by the explosion. He saw a moving mass of red and black colours. For a few seconds after striking the ground he was unable to move. He rapidly regained movement, first of his right arm and then of his whole body, and he was able to speak and get up. He found that he was completely blind and he had to be led back to the command post seventy yards away. Here he was able to make out the light of a paraffin lamp, but nothing more. By the time he had reached the Field Ambulance one hour later he was still unable to distinguish more than light or dark. On the following day he was operated on; the skin wound was excised and sutured, after presenting bone fragments and pulped brain had been removed.

On the second day after injury some sight returned in his right upper visual fields. On the fourth day after injury he could make out faces and other objects to his right side, but these were still blurred. On the tenth day he could read printed words on his field card and could see clearly in his right fields and not at



all in his left fields. During the next eight weeks there was gradual improvement of the left upper visual fields and his ability to read became almost normal.

When seen by us about ten weeks after the injury he had a steep-edged congruous left lower quadrantic homonymous hemianopia, and his visual acuity was 6.5 in each eye. There were no other neurological signs. X-rays showed fragments of bone in the right occipital lobe.

After the injury this patient had deafness, tinnitus, and some discharge from the right ear which gradually passed off completely.

This case illustrates the well-known fact that focal damage to the brain after gunshot wound is by no means solely due to the penetrating foreign body. Bone fragments entered the right occipital lobe, breaking up the upper half of the right geniculo-calcarine pathway with a resultant left lower quadrantic hemianopia of permanent character. The initial symptoms, however, were those of complete blindness. During the following days vision recovered in an orderly manner: first in the right upper fields, then in the right lower fields, and finally, after some weeks, in the left upper fields. The permanent damage was of very limited extent and corresponded to the track of the foreign body. The temporary damage affected a wider, but, if we may judge from the clinical evidence, fairly sharply defined zone; and the severity of this completely reversible process varied inversely with the distance from the site of injury.

The focal damage that can be produced without penetration of the brain is illustrated by the following case:—

*Case 7.*—Guardsman A. C. (Serial No. 78) was struck by a bullet which made a large hole in the back of his steel helmet and produced a scalp wound and fissured fracture in the left occipital region, without any depression or penetration. He did not lose consciousness, but his sight became misty. He was able to walk back unaided about one mile, but his sight then failed so that he could only perceive light. Thereafter his sight gradually recovered, but he could not read small print until three weeks after the injury. Two months after the injury his fields and acuity were normal and he showed no neurological signs.

Cases of this type were reported during the 1914-18 war by Hine (1918), who was able to trace the recovery from homonymous hemianopia by day-to-day perimetry. It is interesting to note that in Case 7 the focal damage was gradual in onset, and this has been observed in other cases. It suggests that the cause is cerebral or meningeal hæmorrhage of limited extent. Examples of focal damage are seen affecting parts of the brain other than the occipital region.

*Case 8.*—Lt. G. H. M. (R.I. No. 9311) was hit by a shell fragment which pierced his steel helmet in the right Rolandic region and fractured the bone without penetrating the dura. He was not unconscious and continued fighting for some time, although his face was paralysed on the left side and he was grossly dysarthric. Three days after injury the missile was removed from the skull. Two months later the wound was reopened on account of persistent discharge, and five loose fragments of bone, most of them dead, were removed from between skull and dura. The left facial paralysis cleared up almost completely in the first three weeks, but traces of it were still distinctly visible four months after the injury.

The brain damage associated with scalp wounds was described by

Jefferson (1919) in an important paper at the end of the last war. Among 54 cases of scalp wound treated by him there were seventeen which showed signs of local contusion. "In the Rolandic region," he writes, "such signs can be traced through all grades of severity, from a local increase of the tendon jerks . . . up through slight aphasias, numbnesses, and pareses, finally culminating in definite palsies and Jacksonian fits." He points out that while it is easy to recognize the signs of contusion of the Rolandic and occipital regions it is extremely difficult to recognize contusion of silent areas. In some cases of focal brain injury an extradural or subdural clot is found, but in others inspection of the dura at operation has shown no evidence of abnormality, and it is probable that the primary pathological lesion is a bruising of a limited area of cortex and meninges below the site of the injury.

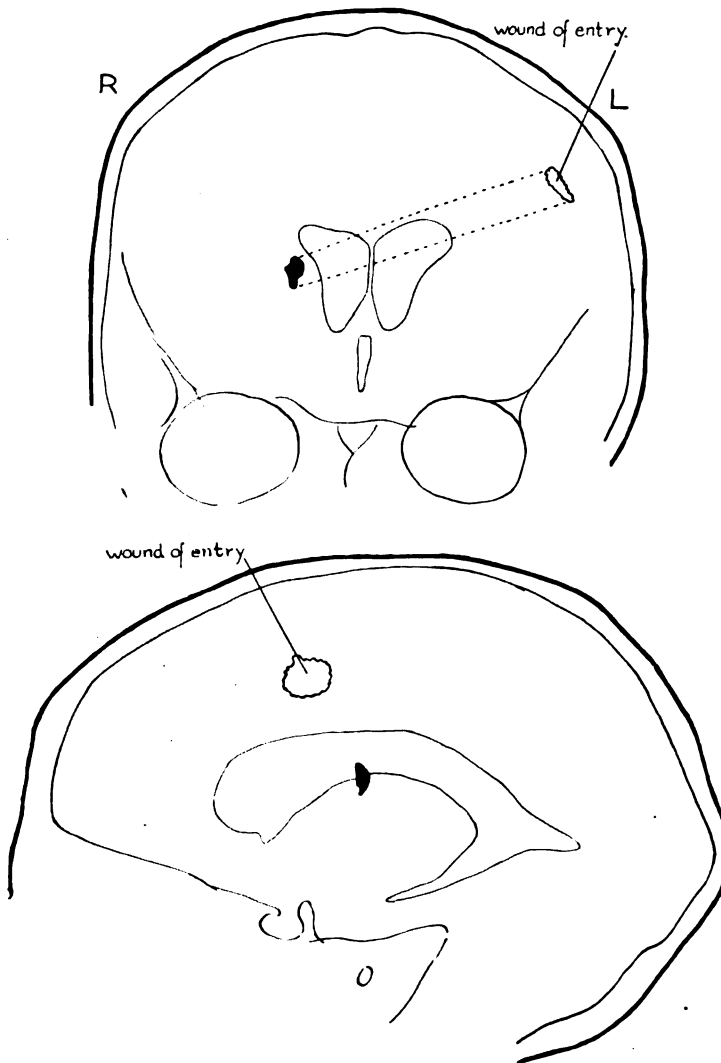
In the cases of this series there has been only one showing evidence of *contre-coup* damage, but Jefferson had four cases in which there was increase of tendon reflexes on the side of the scalp wound. In penetrating wounds, Dupérié (1916) reported homolateral signs, such as Jacksonian epilepsy and hemiplegia, and in necropsies he found *contre-coup* damage in 17 of 100 cases. This type of damage appears to be more common in the severe cases; of Dupérié's sixteen patients showing homolateral signs, seven died. In the one case of our series a patient with a deeply penetrating bomb wound of the left frontal lobe and right hemiplegia also had complete paralysis of the left lower limb. At operation the sagittal sinus was patent and there was no evidence of fracture, or of extradural or subdural hæmorrhage over the right hemisphere.

#### SPONTANEOUS RECOVERY FROM FOCAL SYMPTOMS.

It appears that after gunshot wound there is a strong tendency for the focal signs to undergo spontaneous improvement or recovery. This applies to penetrating brain wounds as well as to wounds of the scalp and skull. The tendency may be more evident in this war than in earlier ones, owing to the relatively greater incidence of small metal fragments of high velocity.

*Case 9.—Penetrating bifrontal wound with retained metal foreign body. Severe aphasia. Spontaneous recovery.*—A. A. S., a civilian, aged 32 (Serial No. 69), was wounded by a bomb which landed about thirty feet from him. He received multiple superficial wounds, and one metal fragment, in size slightly less than 10 by 3 by 5 mm., penetrated the left side of the frontal bone and lodged in the right hemisphere (fig. 1). Subsequent encephalograms showed that its track through the brain crossed the lateral ventricle and the corpus callosum. A reliable observer states that after being hit the patient was still standing, hanging on to a support. He was able to walk with assistance; he was unable to speak, but made signs to indicate his wants. In the left frontal region there was a wound from which blood and brain tissue were protruding, and there was another superficial wound in the left parieto-occipital region. Five hours after injury the scalp wounds were excised, and blood-clot and bone fragments were removed from the superficial part of the penetrating frontal wound, but no attempt was made to remove the foreign body. The patient was given antitetanic serum and a course of sulphonamides.

When first seen by us about forty-eight hours after the injury the patient looked ill. Temperature 99.6° F., pulse-rate 106. He was conscious and understood simple commands, but motor speech was limited to a few single words, such as his surname. There was a leak of cerebrospinal fluid from the penetrating left frontal wound. He had considerable neck stiffness. There was slight weakness



FIGS. 1A and 1B, Case 9.—Transventricular penetrating G.S.W. with retained missile.

of the right side of the face, coarse tremor of both hands, more so on the right side, and slight weakness of toe movements on the right side. The abdominal reflexes were absent, both plantar reflexes were extensor in type, and he had retention of urine. As far as could be tested, sensory function was intact. Lumbar puncture yielded blood-stained fluid under an initial pressure of 190 mm. ; total

protein 240 mgm. per cent; red cells 27,800, white cells 520 per c.mm.; polymorphonuclears 69 per cent, lymphocytes 31 per cent; on culture a few colonies of *Staphylococcus albus*. X-rays showed a foreign body deep in the right frontal lobe (fig. 1).

The outlook in this case at first appeared grave, but within three days the improvement in speech, the cessation of the cerebrospinal leak from the wound and the diminution of the white cell count in the cerebrospinal fluid showed that our initial fears of fulminating meningitis were groundless. On the fourth day after injury voluntary control of micturition returned. By the fifth day he could read simple sentences slowly, and could understand simple commands, though his performance was inhibited very easily. He named most objects correctly but slowly. There was profound disturbance in writing and in calculation. Spontaneous speech was absent. There was also a notable absence of spontaneous and semi-automatic movements. He was confused as to time and place. For the first two weeks after the injury he could not recall any events since going to work on the morning of the injury.

Recovery progressed gradually and by four weeks after the injury he had recovered spontaneity in speech and action and had regained his mental faculties and confidence sufficiently to mix freely with the other patients. There was still difficulty in calculating and in reproducing what he had read. Spelling mistakes were frequent, especially in writing words out of context. Three and a half months after the injury there was further recovery, but he was still slow in calculating and still showed complete lack of understanding of mathematical symbols. He was, however, able to do light work in his garden.

In this case a small fragment entered the left frontal lobe just in front of the precentral gyrus, traversed both lateral ventricles, and lodged deep in the right hemisphere. There was at first a profound aphasia and also a leakage of cerebrospinal fluid from the wound. During the next four weeks there was a rapid and steady recovery of speech. Excision of the foreign body was out of the question owing to its depth, and the degree of spontaneous improvement was greater than had been expected.

Spontaneous recovery from hemianopia after penetration of the occipital lobe has already been noted in Case 6. In Cases 6 and 9 the residual functional damage was so slight that it could not have been bettered, and might easily have been aggravated, by early operation on the brain itself.

In the last war complete excision of the foreign body and its track of damaged brain was advocated and practised by experts on the following grounds:—

(1) To remove infective material which might otherwise produce meningitis or brain abscess, and dead brain tissue which would act as a favourable nidus for infection.

(2) To remove massive clot, extradural, subdural, or intracerebral, which might otherwise be fatal or produce further local brain damage.

(3) To diminish the liability to epilepsy occasioned by a retained foreign body.

The third point still remains to be proved, and in any case it does not necessarily bear on the question of early operation, for experience may show that, if foreign bodies are to be excised with the idea of diminishing the

liability to epilepsy, the best time for doing so is some weeks or months after the injury, when the wound of entry has healed.

The indications to remove clot and septic material remain valid, but it is clear that in a number of cases of this war, infection and massive clot do not develop; the changed conditions of warfare, chemotherapy, and, possibly, a relative decrease in size of high velocity missiles may contribute to this. Another indication also comes more clearly into the picture from recent experience, and that is that operations on brain wounds should not interfere with the spontaneous recovery of brain function that tends to occur in the days following injury. To judge from the literature of the last war, functional recovery after operation was often ascribed to operation. Our experience is sufficient to show that operation cannot cure focal signs which are the immediate sequel of penetrating wounds. The presence of such signs is not an indication for operation. It is only the signs of delayed onset and progressive course, due to clot, infection, or *ærocele*, which may be amenable to surgery.

Our experience of this war is so far small, particularly in regard to the more severe cases that tend to die in the first few days after being wounded, and no hard and fast rules for the treatment of penetrating brain wounds can yet be made. There is a suggestion, however, that a conservative policy may often be of value, particularly when the penetrating body is small; and there is an absolutely clear indication for the most careful observation of the development and course of the neurological signs in the first hours and days after the injury, together with thorough bacteriological studies of the wound.

Meanwhile the case for early operation to clean surgically the skin and superficial parts of every head wound, and where possible to do primary suture, remains clear. The sooner the wound is thoroughly cleaned of hair, dirt, bone splinters, and other foreign bodies down to the dural level, the less the risk of subsequent complications. Within the brain every manipulation potentially increases the brain damage and diminishes the extent of functional recovery, and therefore the utmost caution and gentleness must be exercised.

#### THE TREATMENT OF SCALP WOUNDS.

The experiences of this series show the extreme importance of surgical treatment of scalp wounds in the early stages. There were 15 cases of non-penetrating injury in 9 of which the laceration was confined to the scalp, while in the remaining 6 the skull also showed a small, usually linear, fracture. In 5 of these superficial wounds complications occurred, owing to inadequate treatment of the wound in the early stages; one patient died and another almost died from these complications (Table I).

This last case has already been mentioned (Case 1). The patient had a subdural abscess following a right parietal scalp wound, without fracture of the skull and without loss of consciousness. The wound was never excised. The notes state that on the day following injury the wound was "dirty, but showed no signs



of gross infection. Hypertonic saline dressings." Seven days after injury the wound was purulent and oedematous, and discharged pus containing a heavy growth of hæmolytic streptococcus; there was fever and malaise; sulphonamide treatment was now begun. Two weeks later the patient developed left hemiparesis, together with signs of meningitis (turbid cerebrospinal fluid which was sterile on culture). On admission to this hospital he was semicomatose, and showed early papilloedema, severe motor and sensory loss of the left arm, and, to a less extent, of the left leg. The cerebrospinal fluid contained 273 white cells per c.mm. At operation (Major P. B. Ascroft) beneath the granulating scalp wound a subdural abscess was found. It contained about 15 c.c. of pus from which streptococci were grown. After operation recovery was not absolutely complete, some slight sensory disability persisting in the left hand.

If, when this man reached hospital twenty-four hours after injury, his scalp wound had been excised, dusted with sulphonamides, and sutured, there is little doubt that the subdural abscess would not have developed.

The fatal case of scalp wound was as follows.

*Case 10.*—Pte. H. W. (Serial No. 58) was wounded in the right occipital region by a shell fragment on June 1, 1940. His helmet was impacted in his scalp and a scale of metal, 1 cm. in diameter, was embedded in the outer table of the skull, but there was no radiating fracture. He was not unconscious. The wound was excised and sutured on June 3. On June 8 he had an epileptic fit, and next day, for the first time, severe headaches, followed by progressive drowsiness. On admission to this hospital on June 11, there was an indolent scalp wound in the right occipital region. The patient was drowsy and showed complete left homonymous hemianopia and slight neck rigidity. The lumbar cerebrospinal fluid showed 3,200 white cells per c.mm. Sulphonamides were started. On June 14, the wound was opened and an extradural abscess was drained (pus contained *Staph. aureus* and streptococcus). The wound was excised and was dusted with pron-tosil powder. The patient improved for a time and his wound became cleaner, but after some days he became progressively more drowsy. On June 24, a right occipital abscess was drained through the old wound. Progress was not satisfactory and further loculi of pus were drained on July 6 and 9. The patient died on July 10. At post-mortem there was a collapsed abscess cavity and intense oedema of the white matter of the whole hemisphere.

That the excision of the wound on the second day after injury was rather perfunctory is shown by the fact that, at the second operation on June 14, a large flake of metal was found in the depths of the wound, embedded in the outer table of the skull. Even two weeks after injury, dusting of the wound with sulphonamides seemed to improve its condition, but this had no influence on the course of the patient's illness, for by that time he had an extensive cerebral abscess.

These cases suggest that in scalp wounds the risk of infection spreading through the intact skull and dura is greater after gunshot wound than after blunt injury. The high incidence of focal signs in gunshot wounds of the scalp indicates that the underlying zone of brain tissue is severely damaged, much more so than in scalp wounds due to blunt injury, and the resistance of this part of the brain to bacterial infection is correspondingly reduced. The skull at the site of impact is probably similarly affected, even though it may not be fractured.

In the other three cases the complications of scalp wounds were mild : in two there was local osteomyelitis, with persistent discharge from the wound until sequestra were removed ; in the third an abscess formed about two fragments of bomb-casing in the scalp. The frequency with which bone and brain became infected after gunshot wounds of the scalp and skull in this series indicates clearly the importance of careful operative treatment of what are apt to be regarded as trivial wounds. From the point of view of conserving man-power, the operation of cleaning and closing a scalp wound is much more important than the operation of removing a foreign body from the brain.

This simple operation is badly done by many surgeons. The most common mistake is to regard the operation as a minor one which may be performed in an aid-post or in a casualty room. The skin around the wound is shaved in a perfunctory manner and over a small area. If manipulation of the wound is painful, as when no anæsthetic is given, it is inevitable that the wound is not thoroughly explored and that it is cleaned and excised imperfectly.

Many surgeons still adhere to the method of closing the scalp by a single layer of widely spaced and tight sutures. By this procedure the blood supply of the wound edges is impaired and the sutures, which must be retained for several days, tend to cut through the skin. The result is an unsightly scar with ugly cross marks ; and often there is failure of primary union in part of the scar.

A standard method of scalp closure has now been adopted by surgeons accustomed to operating on the head. The main principle is to close the scalp in two layers with interrupted stitches of fine silk or thread (Commercial size, No. 28, black silk). The deep layer of sutures joins the thin but firm galea aponeurotica and the sutures are placed 1 cm. apart ; this approximates the scalp and takes all the tension. The sutures are cut close to their knots and are buried in the wound. The superficial stitches are then tied only tightly enough to bring the superficial edges of the wound together, and they can all be removed within forty-eight to seventy-two hours. The two layers are effectively hæmostatic, and it is not necessary to ligate scalp vessels. As the wound heals its scar is small and there are no cross marks ; on the forehead the scar should eventually be almost invisible. The buried stitches are not irritating even in a scalp wound that is slightly infected, and they do not give trouble if cut close to the knot. If silk or thread cannot be obtained, very fine catgut (00) may be used, though catgut produces more reaction in the tissues than does silk or thread.

Cleansing and excision of scalp wounds can only be carried out satisfactorily in an operating theatre and with good regional or general anæsthesia. The first step is to shave the scalp for a wide area (4 to 5 inches) around the wound. The wound edges are then opened and the depths are carefully examined for dirt, hairs, glass, bone and metal fragments. All of these should be meticulously removed, and, when it has been established that the dura is

intact, forcible irrigation with normal saline or Ringer's solution, or with a mild antiseptic such as proflavine sulphate (1:1000), will assist. Ingrained dirt cannot be removed except by excision; in scalp wounds the pericranium and loose connective tissue can be excised freely, but removal of the more superficial layers should be done as sparingly as possible, otherwise it may be difficult to get approximation without excessive tension. Not infrequently in gunshot wounds the missile destroys part of the skin, and then the cleaned excised scalp wound must be left open, or may be closed by a sliding graft. Light dusting of the wound with sulphonamides before closure is not irritating and is evidently a helpful measure against infection, particularly in those cases which arrive late at the C.C.S. and in which the wound edges are already reddened and oedematous. Scalp wounds can be excised up to three days and longer after injury. In the forward area, where no operating facilities are available, it is better to apply a moist flavine pack with firm bandage than to close the scalp imperfectly and without cleaning the depths of the wound.

#### SUMMARY.

A series of twenty-nine cases of recent gunshot wound of the head is described. The clinical syndrome of concussion is usually absent and careful study of those gunshot wounds in which immediate and sustained unconsciousness occurs may throw light on the mechanism of production of unconsciousness in blunt head injuries. In gunshot wounds, both those with dura intact (non-penetrating injuries) and with dura penetrated, focal neurological symptoms are more common than in blunt injury. These symptoms show a strong tendency to spontaneous recovery and this fact should be taken into account when considering the operative removal of foreign bodies and dead brain tissue from the brain itself. At this stage of the war no rules can be made about the operative treatment of intracerebral damage, though the case for early and thorough treatment of the parts of the wound superficial to the dura is clear enough.

Gunshot wounds of the scalp tend to be followed by infection of the underlying skull, subdural space, and brain unless they are thoroughly treated. The apparently trivial operation of cleaning and suturing a wound of the scalp is probably the most important neurosurgical operation of war.

Secretarial assistance with the case records of the hospital was provided by the Medical Research Council.

#### BIBLIOGRAPHY.

- CUSHING, H. (1918), *Brit. Journ. Surg.*, 5, 565.  
DUPÉRIÉ, H. (1916), *Rev. Neurol.*, 29, 616.  
HINE, M. L., (1918), *Brit. Journ. Ophthalm.*, 2, 12.  
JEFFERSON, G. (1919), *Brain*, 42, 93.

## SCABIES.

BY LIEUTENANT F. L. LYDON,  
*Royal Army Medical Corps.*

## (1) INTRODUCTION.

FROM the dermatological point of view valuable time is frequently lost in the training and efficiency of troops owing to infection by scabies, impetigo and epidermophytosis. Early diagnosis, rapid reliable treatment and preventive measures are necessary if satisfactory control is to be established.

The following paper, describing the results of 1,041 cases of scabies investigated and treated at the Skin Department, Connaught Hospital, will, I hope, contribute a little towards the elimination of scabies from the above-mentioned group, and it is hoped that the experience of the department in impetigo and epidermophytosis will be given at a later date.

## (2) DEFINITION.

Scabies is a contagious disease caused by infestation with a mite, the *Acarus* or *Sarcoptes scabiei*, characterized by great itching, worse at night, by the "burrows" made by the pregnant female parasite, red follicular papules, evidence of scratching and often of secondary infection with pyogenic cocci. The "burrow" is usually not more than a quarter of an inch in length and appears as a whitish or erythematous raised line with often a vesicle containing clear fluid at the blind end. The *Acarus* may in some cases be seen as a whitish speck just distal to the vesicle, and can be removed for microscopical examination with the end of a fine needle.

## (3) PARASITOLOGY.

The female *Acarus* is a minute white body about 0·3 millimetre in length, oval in shape, with four legs in front terminating in suckers, and four behind terminating in spines. The male is about half the size and is rarely found. The cycle from adult pregnant female may be represented thus:—

<i>Pregnant female.</i> (Burrows into deeper parts of horny layer.)			
3 days.		moults.	moults.
Lays 40-50 eggs.....	Larva.....	1st Nymph.....	
Female adult.			
2nd Nymph.....	Impregnation.....	Adult pregnant female.	
Male adult.			

The development as far as the 2nd Nymph stage probably takes place in the original "burrow," scratching then takes place with the liberation of the adults thus facilitating spread to other areas. This cycle takes seven to thirteen days and it is stated that the adult female may under certain

conditions of warmth and moisture live apart from the body up to ten days, and that the ova may develop up to six to seven days. There is some evidence, however, that these limits are much too narrow and that infected blankets may transmit the disease weeks and perhaps months afterwards—attention is being directed to this point, and any evidence will be published at a later date.

#### (4) SYMPTOMS.

The primary symptom is intense itching, worse at night, coming on shortly after going to bed. This complaint may vary, and cases are seen with a widespread infestation with little complaint, whilst others with little to show will describe the itching as unbearable. Again, in cases with secondary infection, itching may be completely absent, and this is of paramount importance owing to the possibility of the correct diagnosis being missed, with the consequent further spread of the infection to others, and ineffectiveness of treatment of the individual affected.

The nocturnal character of the itching is best brought out by avoiding leading questions. If asked, "Of what do you complain?" this special character of the itching is usually volunteered and stressed by the patient.

#### (5) DIAGNOSIS.

The practice of the department is to strip the patient and make him face a window giving a good light. He stands erect, arms by the side, palmar surface of the hands facing forward. In this way the characteristic grouping of the eruption is seen at a glance in the great majority of cases and the following points are to be noted.

(1) The anterior aspect of the wrists, the inner and, in my experience, the outer, anterior aspect of elbow-joints, the anterior axillary folds are affected by a papular eruption, showing evidence of scratching with perhaps an occasional pustule or scab.

(2) The chest is usually clear, whilst the abdomen may be heavily and is often generously covered. The thighs, anterior surface, especially upper third, are almost always affected, but the really striking point is that the penis has in practically every case one, or maybe several, lesions, which in my experience clinches the diagnosis.

The importance of the penile signs are such that it is the practice of the department to doubt the presence of scabies, if they are absent, and therefore one should always search for them if not immediately obvious, since cases are frequently seen under Service conditions in which the penis, anterior surface of thigh, and perhaps abdomen are affected, and the interdigital clefts are completely free. This may at first sight appear strange; but the hands of the serving soldier are frequently washed, whilst on the other hand it is the general practice to sleep in the shirt and vest worn during the day, and consequently the female *Acarus* has a longer time to "burrow" into the areas mentioned. Two types of penile lesions are found, one most

frequently on the body of the penis, the other most frequently on the glans, and they may co-exist. That on the body is a slightly raised, elongated or oval-shaped papule showing evidence of having been scratched; and that on the glans usually has the well-known vesicle present, often unruptured.

The patient is now turned round, and then the almost complete freedom of the back from shoulders to nates is noted, whilst the buttocks usually show evidence of both papules and "burrows" which may extend laterally to the trochanteric surface on both sides. Next, closer inspection of hands, especially interdigital clefts, ulnar border and base of thumb is carried out, and a search made for the characteristic "burrows." Lastly, the legs and feet are examined, but in my experience a few scattered papules are all that are found in these areas.

It is to be noted that although the above distribution is in a general way followed more or less closely, all parts mentioned may not be affected simultaneously; but if the general picture is remembered, this, with the symmetry of the lesions and especially the penile signs, will help to avoid the risk of missing cases of scabies during the routine inspection of troops. Even in those cases with secondary infection superadded, the characteristic grouping of the lesions at once gives the clue to the cause, especially as the itching may be absent. In these cases, however, I have found that one group of secondarily infected scabies needs special mention, since the distribution is not typical and itching is nearly always absent. The characteristic finding in this group is numerous shallow, indolent ulcers on both legs, covered by an adherent scab, and surrounded by a blue zone of "erythema." Elsewhere little is noted, but if the possibility of scabies is remembered, closer search will reveal evidence of scabies, and here again the penile signs are rarely absent. Lastly, it should be noted that the face and neck are never affected.

Briefly then the clinical diagnosis depends on: (1) Itching, usually worse at night; (2) typical picture on inspection; (3) penile signs and points of predilection on hands and anterior axillary fold (these are valuable signs); (4) comparative freedom of back and chest, and absence of lesions from face and neck; (5) the presence of the characteristic "burrow."

#### (6) DIFFERENTIAL DIAGNOSIS.

In our experience the following are the conditions most frequently confused with scabies:—

(1) *Lice Infestation*.—Here itching is intense, and there is often a suggestion of a nocturnal tendency. This is I think again due to the fact that the shirt and vest are used for sleeping purposes and the warmth of the bed activates the parasite. However, the above method of inspection will show the long linear scratches between the shoulders and lower sacral region so characteristic of lice, and inspection of shirt and vest will clinch the diagnosis. In some cases of lice infestation, however, I have seen

scratched-top papules with a marked tendency to grouping round the anterior iliac spine, and the lower part of each axillary area, with no scratches between the shoulders ; and if this co-exists with a folliculitis of the thighs, which is very common in the serving soldier, the mistake is perhaps not so strange. Here, again, however, the grouping is different and the penile signs are invariably absent, and, as I have said before, this always throws doubt on the diagnosis of scabies. It must be remembered, however, that the two conditions may co-exist, but in my experience this is rare.

(2) *Pediculi pubis*, fleas, and, in those living under canvas, gnat bites, etc., are sometimes considered to be scabies, but attention to the main points of scabies infection as above outlined should prevent such mistakes.

(3) *Urticaria*.—This is a frequent source of mistaken diagnosis, especially in those peculiar cases occasionally met with under Service conditions of a fairly widespread eruption of red papules of an urticarial nature without any obvious surrounding zone of erythema. These papules appear in crops and itch intensely, but the penis is never affected, whilst I have found the papules present in the interdigital clefts. Some cases were so suspicious that the diagnosis was only proved by the absence of any relief after treatment, and, here again, the importance of the penile signs was justified. The common practice of giving saline purgatives in urticaria ought to be discontinued, as we find that often the only treatment necessary is to stop the saline, and the condition clears without any further trouble.

(4) In some early cases of pityriasis rosea itching was intense, and worse at night, but the developed eruption showed the true nature.

(5) *Venereal Sore*.—Some penile lesions were mistaken for venereal disease, but attention to the main points of both diseases should prevent such mistakes. However, in cases where exposure has occurred, it is wise to keep the patient under surveillance owing to the possibility of the subsequent development of syphilis on the original scabies "burrow." A few cases were complicated by gonorrhœa, showing the venereal nature of the disease in some instances, but this, however, was infrequent.

(6) Lichen and some cases of eczema with secondary infection were also thought to be scabies, but this was rare, and the true nature was apparent when the affected parts and the individual lesions were examined.

#### TREATMENT.

*Disinfestation*.—The importance of this part of the treatment needs hardly be stressed, since, without it, all treatment is futile. Points to be remembered are that all clothing possessed by the patient should be sent to hospital for disinfestation, especially the greatcoat which in warm weather is likely to be forgotten, and the cuffs might possibly cause reinfection later if this precaution is not taken. Again wristlet watches are so frequently used nowadays that the orderly in charge of treatment should pay special attention to their disinfestation. Blankets, etc., are the concern of the unit M.O., and neglect of this point will bring unsatisfactory results.

*Treatment.*—On February 12, 1940, the treatment of scabies by Danish lotion was introduced into the Skin Department at the Connaught Hospital. The “lotion” is a mixture of equal parts of isopropyl alcohol benzyl benzoate and soft soap, and was first introduced by War Office letter, A.M.D. 5/3367/40, dated January 2, 1940.

From February 12, to July 12, 1940, one thousand and forty-one cases were treated by this method with extremely gratifying results, as will be seen in the following table :—

No. of cases treated	Readmission	Non-disinfection of blankets	Wristlet watch	Reinfection from wife	Unaccountable
1,041	11	3	1	2	5

The details of the treatment are as follows : The patient is put into a bath (temperature 105° F.) and allowed to remain there for a quarter to half an hour. While still wet he is painted from the shoulders to his toes with the lotion, applied with a fairly stiff brush with a span of about three inches across the bristles. This coat is allowed to dry (usually taking about ten to fifteen minutes) and a second one applied. During application special attention is directed to parts commonly affected. The patient then dons “hospital blues” and is sent to his ward with special instructions not to wash his hands or put them in water for twenty-four hours. At the end of twenty-four hours a cleansing bath is given, lotio calaminæ applied, and after inspection the great majority are then discharged from hospital, i.e. twenty-four hours after admission. Lotio calaminæ is recommended for seven days after discharge and surveillance is carried out fourteen days later.

In heavily infected cases, and in those who have had the condition for more than ten days, a second treatment is usually ordered, but on this occasion painting is carried out in the evening, and the cleansing bath taken in the morning, as, in this way, the lotion is only in contact with the skin for about twelve instead of twenty-four hours.

*Secondarily infected cases* are treated as above on admission, and after the cleansing bath, local treatment is ordered, and most cases respond fairly rapidly to the judicious use of lotio calaminæ c̄ ichthyol 1 per cent, with the use of hydrarg-perchlor (1 : 5,000) applied by swabbing after a bath. When the secondary infection has cleared up, the patient is again painted on the day before discharge as a precautionary measure. The possibility that scabs of secondarily infected cases may contain the *Acarus* at some stage in its cycle, capable of developing under suitable conditions, has led us to endeavour to discharge these cases free from all crusts. This point is now receiving attention in the department.

During treatment it is advisable for both patient and orderly to wear eye-shields, as in the early days of treatment a few cases of marked conjunctivitis occurred. This cleared rapidly on routine treatment, but in my opinion the above precaution should be taken, as none has occurred since this procedure was adopted.



*Complications.*—Not the least gratifying result of the treatment is the complete absence of complications so common after the use of sulphur. There were no cases of secondary dermatitis due to the lotion in the series, yet on some occasions the lotion was in contact with the skin for forty-eight hours, i.e. treatment on day of arrival, cleansing bath next day, with immediate repaint and cleansing bath again the following morning. (Edema of prepuce, and occasionally of the scrotum, is common but disappears within twenty-four hours after taking the cleansing bath. A slight burning sensation is felt by most, but the complete absence of the itching due to the *Acarus* is so marked on the night following treatment, that inquiry must be made to elicit this fact. The conjunctivitis which occurred before the eye-shields were introduced has already been mentioned.

#### SUGGESTION FOR FUTURE CONTROL.

(1) *Blankets.*—It cannot be stressed too strongly that blankets are the chief means of spread of scabies infection, and unless strict control is instituted cases will continue to appear in their present numbers.

(a) *Blankets of the individual.* (i) Under war conditions the movement of troops from place to place is so frequent that some method should be devised to prevent blankets being mixed during transit, as I have found this a common method of spread. (ii) The disinfection of blankets of individuals sent for treatment is important. (iii) Disinfection of all blankets left by men on posting to other units should be carried out.

(b) After vacation of barracks by troops, all blankets left behind should be disinfested before re-issue.

(2) *Hostels.*—These are another common source of infection and spread, since large numbers occupy the beds in a short space of time, and it would be utterly impossible to disinfect the blankets before being used again. To prevent the full effects of this source of infection, and that of the soldier who is infected in his own home, all men who go on leave, even for a week-end, should be inspected at the end of two weeks after returning to the unit, as well as on the day of return. In this way, spread of infection in the unit would at least be controlled.

(3) Attention should also be paid to the fact that soldiers carrying out guard work at night take their own blankets to the guard-room bed, which must facilitate the spread of scabies as the "biscuits" on these beds are there permanently.

(4) Since scabies is not a common disease in civil life, lectures and demonstrations on scabies should be arranged in the Skin Departments of the various Commands.

(5) A weekly return of the number of cases of scabies occurring in each Command should be made showing: (i) Number of cases developing in the Command. (ii) Number of cases discovered on arrival in the Command, (a) From other Commands (Command to be stated), (b) From civilian life.

The real value of the measures taken against scabies by the different Commands could then be assessed, and any striking differences investigated.

#### CONCLUSIONS.

1,041 cases of scabies were treated by Danish lotion in the Skin Department at Connaught Hospital, between February 12 and July 12, 1940, with the results given above.

These results show that this method has advantages over other forms of treatment, and that it should therefore be adopted as the routine Army method for the treatment of scabies.

The advantages are as follows : (i) Reduction of hospitalization time to twenty-four hours. (ii) Absence of complications due to treatment. (These two factors reduce the number of beds which must be kept available for cases of scabies, and also markedly reduce the period of incapacity of those affected.) (iii) Reliability is not sacrificed to speed, as the results given amply demonstrate. (iv) The method is easily carried out after a short period of instruction of personnel.

The method of clinical examination of suspected cases carried out in the department is described, and will, I hope, be of help to others in the diagnosis of scabies.

Suggestions for the future control of scabies are also given, and should, if carried out, lead to a reduction of the incidence of scabies amongst the troops.

---

## ANTI-SCATTER TREATMENTS FOR WINDOW GLASS.

### NOTES FROM THE INFORMATION BUREAU OF THE BUILDING RESEARCH STATION<sup>1</sup>

VARIOUS methods which can be adopted to provide protection from flying glass from windows broken by blast have been described in publications<sup>2</sup> of the Ministry of Home Security; they include such measures as the provision of various forms of screens and shutters, the fixing of wire mesh and, finally, the application of adhesive treatments to the glass itself. It is with the last named that this note is concerned. Tests of such materials are undertaken for the manufacturers at the Building Research Station and arrangements have recently been made whereby a list of those of them that have been tested and approved as affording a useful measure of protection by limiting or preventing the scattering of the glass fragments will be kept at the Station and at the Research and Experiments Branch of the Ministry of Home Security. Firms having a material which is included in the approved list will be authorized so to describe it in their advertisements.

In view of the number of inquiries that are being received regarding such treatments, and notwithstanding that it is not the general practice in Government publications to mention proprietary materials by name, it has been considered useful in present circumstances to publish the present note which discusses the various types of adhesive treatments and includes a list of materials that are at present (September 19, 1940) on the approved list. The list is subject to alterations by additions and, maybe, subtractions, but the arrangement whereby firms having materials on the approved list can advertise them as such will serve as a means for keeping it up to date. Further, the practical recommendations included in the note are given in the light of information at present available and may be subject to some modification, though practical experience gained so far has served to confirm that they are well founded.

It should be realized that no treatment applied to the glass will prevent its being broken, nor will even increase its chance of remaining unbroken when a bomb explodes nearby. Moreover, an approved material will not give good results unless it is properly applied, i.e., applied in accordance with the recommendations made in this note.

The present note mentions four different types of treatment. It is not intended to suggest that all four types afford an equal measure of protection, but tests have shown that all the materials named, if properly applied, are useful. The choice of a particular type of treatment for a particular job must be left to the user, since it will depend upon various considerations,

<sup>1</sup> Crown Copyright Reserved. Printed by permission.

<sup>2</sup> e.g., "A.R.P. Memorandum No. 12—the Protection of Windows in Commercial and Industrial Buildings." "Your Home as an Air Raid Shelter."

such as the size of the panes, the importance of the windows to be protected, cost, etc. Moreover, supplies of any one type of material may not always be immediately available and possible alternatives may have to be considered.

#### GENERAL NOTE ON APPLICATION.

Before any treatment is applied it is important that the glass should be clean and free from oil or grease. When using any proprietary article, attention should be paid to the manufacturers' instructions for its use.

##### (1) *Textile Materials.*

According to tests, almost any strong textile netting, such as curtain net, or similar fabric can provide good "anti-scatter" protection if it is stuck firmly to the glass.

Nettings can be obtained for the purpose either plain or ready-treated with adhesive. With the latter type, there are various methods which different manufacturers recommend to get the best results from their own materials, e.g., (i) Dip the netting in water for one or two seconds only, then shake out the excess water and apply the net to the glass; (ii) moisten the netting by spreading it on a wet cloth; (iii) wet the glass, and then apply the dry netting, patting it into place with a wet cloth.

The material should be cut large enough to allow for shrinkage and to permit of it being carried over the frames and stuck to them as well as the glass.

Plain ungummed netting can be affixed with any convenient strong adhesive, e.g. cold water paste, flour paste or gum. The adhesive is brushed freely on the glass and the netting pressed on. If the window is one which is exposed to hot sunshine the addition of a little glycerine (say 5 per cent) to the adhesive will help to prevent it from drying out completely and becoming brittle.

In whatever way the netting is fixed, i.e., whether it is of the ready-gummed type or a plain material applied with paste or gum, its adhesion will certainly be affected sooner or later if the netting is repeatedly exposed to damp conditions; if, therefore, the window is one which opens or if it is often subject to condensation, the netting should be protected with a coat of varnish and in fact it is a useful precaution always to varnish round the edges at least, or secure them with adhesive tape to prevent them coming unstuck.

While fixing, it is often convenient to hold the top of the netting in position by drawing pins or (in the case of steel frame windows) with adhesive tape.

Although netting applied in either of these ways will generally be quite effective in preventing glass flying, the treatment will not necessarily be strong enough to hold up large panes of heavy glass and keep the fragments in place after the window is broken. A stronger and also a more waterproof job can be made by bedding the netting in a good elastic varnish; a full

coat of varnish is brushed on the glass, allowed to get tacky and the netting applied. Finally a further coat of varnish is applied over the whole area.

As the number of nettings which has been tested is large, the list of those at present approved is given in an appendix to this note.

(2) *Transparent Films.*

A good degree of protection can also be obtained by applying transparent film, of which there are many different makes. Those tested have been of two types, namely Cellulose film and Cellulose Acetate film.

A.—(a) *Cellulose Film.*

The following materials have been approved :—

(1) “Celilynd.”—British Celilynd Ltd., Burwell Works, Lea Bridge, Leyton, E. 10. (In this case the film was reinforced with light textile netting.)

(2) “Cellophane.”—British Cellophane Ltd., 17-19, Stratford Place, W.1.

(3) “Diophane.”—Transparent Paper Co., Bury, Lancs.

(4) “Rayophane.”—British Rayophane Ltd., Wigton, Cumberland.

(5) “Sidac.”—British Sidac Ltd., St. Helens, Lancs.

To be effective, the thickness of the cellulose film should be equivalent to a “substance” of not less than 60 grammes per square metre.

In applying cellulose film it is important that the adhesive should be flexible, i.e., one which does not become brittle on drying. Ordinary liquid gum can be used if glycerine or treacle is added in the proportion of about 1 teaspoonful to 2 tablespoonfuls of gum, or alternatively, an adhesive can be made from gum arabic and glycerine as follows :—

Crush the lumps of gum arabic to a powder. Into  $1\frac{1}{2}$  pints of hot water sprinkle 1 lb. of the powdered gum, stirring continuously. Keep the mixture hot (in a double saucepan) till all the gum is dissolved, stirring from time to time. Then cool and stir in 7 oz. of glycerine.

If glycerine should be unobtainable, treacle may be used instead.

The adhesive should be brushed on the glass and the dry film applied with a roller, preferably in strips say 4 inches wide and placed side by side. The film should on no account be wetted or dipped in water before it is applied since this weakens the film and is likely to make it ineffective.

(b) *Self-adhesive Cellulose Film*, i.e. film ready-coated with a tacky adhesive ; this type of material is usually supplied in rolls of widths varying from 1 inch to 4 inches.

The following materials have been approved :—

(1) “A.R.P. Window Tape.”—British Cellophane Ltd., 17-19, Stratford Place, W.1.

(2) “Cerrux.”—Cellon Ltd., Kingston-on-Thames. (In this case the self-adhesive film is supplied together with a varnish ; the two together constituting the “Cerrux Process.”)

(3) “Durex.”—Durex Abrasives Ltd., Arden Road, Adderley Park, Birmingham, 8.

(4) "Sellotape."—Adhesive Tapes Ltd., Brunel Road, Old Oak Common Lane, Acton, W.3.

(5) "Transotape."—Messrs. John Gosherson & Co., 1-6, Beech Lane, E.C.1.

Self-adhesive film has the advantage that it needs only to be pressed on the glass (again with the aid of a roller) and gives a better finished appearance than plain film applied with a separate adhesive. It is not absolutely necessary to cover the whole of the glass with this material, but naturally the closer the strips, the greater will be the protection.

When using this cellulose film it should be carried to the edge of the glass but not over the frames. The reason is that it tends to shrink slightly on exposure and if attached to the frames it will tend to lift at the edges of the glass.

*N.B.*—Since cellulose film, whether plain or self-adhesive, is affected by moisture, it is recommended that the treated panes should be given a waterproofing coat of a good pale varnish or lacquer.

*B.—(a) Cellulose Acetate Film.*

The following materials have been approved :—

(1) "Bexoid."—B.X. Plastics Ltd., Hale End, E.4.

(2) "Clarifoil."—British Celanese Ltd., Celanese House, Hanover Square, W.1.

(3) "Dialux."—Dufay Chromex Ltd., Elstree, Herts.

(4) "Erinofort."—Erinoid Ltd., Stroud, Gloucester.

(5) "Rhodophane."—Messrs. May & Baker Ltd., 42/3, St. Paul's Churchyard, E.C.4.

*(b) Cellulose Acetate Film Reinforced with Textile Netting.*

The materials supplied by the following firms have been approved :—

(1) Cellofabrics Ltd., 11, Gillingham Street, S.W.1.

(2) Messrs. Dobsons M. Browne & Co. Ltd., DelBeta House, Nottingham.

(3) Dufay Chromex Ltd., Elstree, Herts.

Cellulose acetate film cannot be stuck to glass satisfactorily with ordinary gum or paste but most manufacturers can supply suitable adhesives for their own materials or suggest recipes for making them up.

*(c) Self-adhesive Cellulose Acetate Film.*—This type of film closely resembles in appearance the self-adhesive cellulose film mentioned above and is used in the same way. Varnishing is not quite so necessary in this case as cellulose acetate film is less affected by moisture than cellulose film ; nevertheless varnishing helps to preserve the film and adhesive and is, therefore, recommended.

The film marketed by the following firm has been approved :—

Durex Abrasives Ltd., Arden Road, Adderley Park, Birmingham, 8.

*(To be continued.)*

NOTES ON THE GEOLOGY OF THE QUATERNARY DEPOSITS OF THE "PIANURA PADANA" (PLAIN OF THE RIVER PO) WITH THE RESULTS OF BACTERIOLOGICAL AND CHEMICAL EXAMINATIONS OF SOME POTABLE WATERS DERIVED THEREFROM.

BY P. R. McNAUGHT, M.D., CH.B., D.SC.GLASG., D.P.H.CAMBRIDGE,

*Medical Officer of Health, City of York,  
Officer in Charge Hygiene Laboratory, Lines of Communication, British Army in  
Italy, 1918.*

THE ORIGIN AND NATURE OF THE DEPOSITS.

AT the end of the Pliocene period a great tongue-shaped gulf ran westwards from the head of the present Adriatic, bounded to the north and south by huge foldings which had occurred in Miocene times and led to the formation of the Alps and Apennines. Torrential streams from the recently elevated mountains spread far and wide their debris over the site of the present plain. To these accumulations were added, especially on the Alpine side, but to a lesser extent also on the Apennine, those of the glaciers flowing down the valleys during the glacial period and forming immense amphitheatres across their exits on the plain, through which flowed rivers in deep gorges. Examples of these are seen on the course of the rivers Dora Riparia, Orco, Dora Baltea, Ticino, Adda, Oglio, Mincio, Adige, Piave and Tagliamento. In the moraine surrounding Ivrea the debris is piled up to a height of 600 metres. The arc of the Garda moraines stretches for about 100 kilometres.

In many instances lakes are enclosed by the mounds, destined in the course of the ages to be filled up and converted into marshes and later into deposits of peat. The cones of the torrential rivers and the moraines comprising this sub-Alpine zone go to make up an irregular country, arid and stony, and of but slight value for agriculture.

Still further from the mountains stretches a zone of coarse sediments which apparently once covered the entire plain commencing from the region of moraines and insinuating itself between them. Like the previous zones it is due to deposits from the mountain torrents spreading far and wide a thick layer of transported material on reaching more level country, in which the momentum of the streams is suddenly greatly diminished. Typically this formation gives rise to plateaux (altipiani diluviali) composed of the debris of the glacial moraines mingled with alluvial sands and gravels, through which the present-day streams have cut their way, and to whose margins the plateaux slope more or less sharply.

These regions are known as "vaude" or "brughiere" (heaths) in Lombardy. Whilst a part of the material betrays its glacial origin the greater portion is composed of sands and gravels, brought down by the rivers, with pebble beds sometimes cemented to form conglomerate "ceppo."

The plateaux tend to be somewhat arid, and being difficult to irrigate are in parts sterile, in others utilized for cultivation of the vine and mulberry. Peculiar climatic conditions have in places transformed the soil to very considerable depths into a sandy clay of a red colour, "ferretto," related to the laterite of the tropics.

At the same level the Alpine rocks are sometimes affected while the moraines seem to escape the damage.

While the lower plain is composed mainly of deposits of later date, there still remain isolated masses of the more ancient formation which have resisted denudation, e.g. the Hill of San Colombaro, standing 130 metres above the plain (144 above sea level). composed of blue clay and yellow sand of the Pliocene capped by the deposits of the altipiano diluviale.

Nearer the Po in the plain proper ("zona bassa"), the deposits consist of finer materials and in the vicinity of the Po and its tributaries there are alluvial formations laid down by the rivers. Thus the Italian geologists

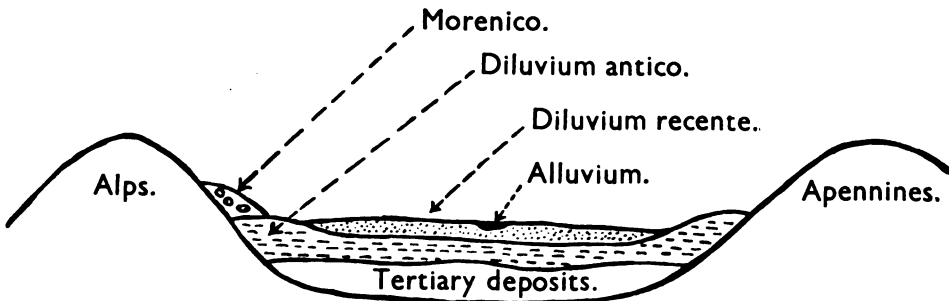


FIG. 1.

recognize in the lower plain ("zona bassa"): *a.* "Alluvium" of modern river system; *b.* "Diluvium recente"—the older alluvial deposits; and in the higher plain ("zona subalpina) of altipiano diluviale; *c.* "Diluvium antico"—partly alluvial from river fans, partly of glacial origin; *d.* "Morenico"—the glacial moraines.

As already noted the upper plain by reason of the coarse material of the soil of which it is composed tends to be arid owing to ready absorption of rainfall. Thus we find there occurs near the junction of the diluvium antico with the diluvium recente, a line of springs, "linea dei fontanili," or "linea delle resorgive," giving rise in parts to marshes. In addition to the springs, water bearing strata are to be found very near the surface, e.g. at Milan 2 to 4 metres and strata yielding a better quality of water at 7 and 14 metres.

#### RAINFALL.

The most copious rains fall in October. There are on the average 106 days per annum on which rain falls, being considerably fewer than in



Central Europe generally. Rain tends to fall in sharp downpours, rather than in fine persistent showers. Periods of drought are rare. Snow is recorded usually nine days per annum between the end of October and the middle of April. In some winters the plain is buried in snow to the depth of several feet so that traffic is held up on the roads and railways. The winter is the driest season, the autumn the wettest, as shown by the following table from Fischer [1]:—

Percentages of annual rainfall (in millimetres).

					Winter.	Spring.	Summer.	Autumn.	Year.
Torino	..	..	..	..	14.7	26.3	31.6	27.3	789
Milano	..	..	..	..	21.3	23.8	23.9	30.9	966.5
Udine	..	..	..	..	21.2	24.0	27.3	27.7	1384
Bologna	..	..	..	..	18.4	20.1	29.7	31.8	536

The area may be roughly divided into four regions of rainfall:—

(1) Central plain of Po (650 to 800 mm.), Tortona, Voghera, Pavia, Mantova 644, Legnago, Bologna 659, Faenza 738.

(2) A belt to north and one to south of the river including the northern slope of the Apennines (800 to 1,000 mm.), Torino 852, Cremona 804.

(3) Approaching the southern slope of the Alps (1,000 to 1,200 mm.), Milano, Treviglio 1,035.

(4) Alps north of the plain (1,200 to 2,437), Tolmezzo (Carnic Alps) 2,437.

The conditions, therefore, favour the supply of deep wells of artesian types, the heaviest rainfall being at the periphery of the basin.

#### CONTOUR.

The plain lies in a great trough with steep sides and is roughly triangular in shape with the Alps to the north and the Apennines to the south, while the base is formed by the Adriatic. The Po between Turin and the sea may be taken as occupying a perpendicular dropped from the apex to the base.

A rise in sea level or a subsidence of 100 to 150 metres would practically restore the condition of the Pliocene time by flooding the plain. The limiting slopes from the mountains to the plain are very steep and thence from north and south are very gentle to the Po.

The plain from west to east also tends very gently to the sea, the Po standing at 212 metres at Turin, 45 metres at the confluence of the Adda, and 9 metres at Ostiglia above sea level. Between Chivasso and Piacenza the fall of the river is approximately 1 in 1,000, between the latter city and the sea, 1 in 2,000. Hence the Po carries gravel as far as Piacenza, beyond that only sand and mud. The volume of its flow varies enormously, from 214 to 5,149 cubic metres per second, and brings down 42,760,000 cubic metres of debris per annum (E. Di Poggio) [2]. Its tributaries from the Alps, fed by the greater rainfall, have been the means of pushing the line of the river in its upper course much to the south of the mesial line of the valley, eastward it becomes more central. The rainfall, as we have seen, on the Apennines, is considerably less than that on the Alps, the rivers are not fed by glaciers and have no lakes to equalize their flow, hence although their flow is at times very great, in the dry season they almost disappear.

This great mass of sediment laid down since the close of Tertiary times, apparently rests on a foundation of Pliocene deposits, of which an almost continuous band dips down on the southern fringe of the plain. Detached portions re-appear on the Alpine border, though the quaternary deposits in the north are banked up against all the formations from the Archæan to the Tertiary. Borings have reached the Pliocene at Forli 80, Reggio at 90 metres and Ravenna 120 metres, but apparently the trough deepens

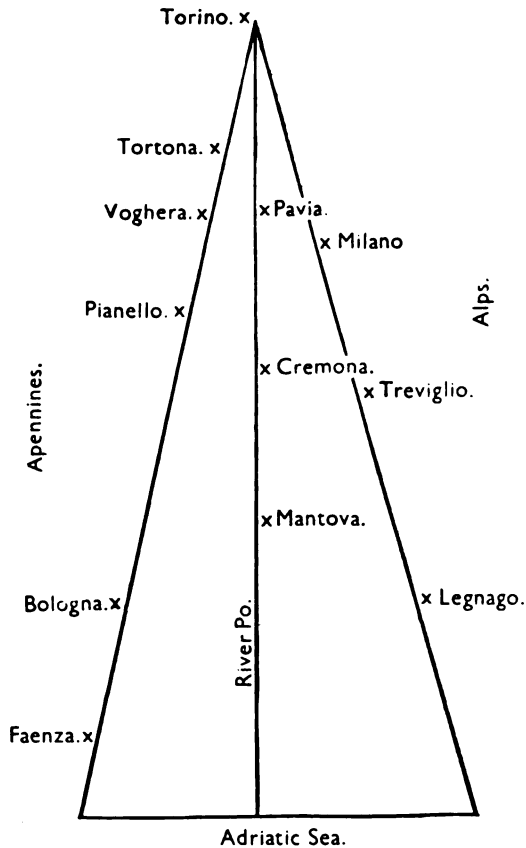


FIG. 2.

to the north, as in the district between Milan and Venice it has not been reached at over 200 metres (Fischer).

#### WATER SUPPLY.

The plain is covered by a close network of channels and ditches, which are important for irrigation and drainage, but owing to their universal pollution by washings from cultivated land and roads, and in villages their use as washing-places and receptacles for filth, they must be left out of count as possible sources of potable water supply. Wells drawing their water

from the subsoil must in general be looked upon with suspicion, especially when sunk in the neighbourhood of dwellings.

The rivers, some of which in the dry months almost disappear and others such as the Po in which the flow is more or less abundant throughout the year, but which contains much suspended matter, and are polluted to greater or lesser extent in the plains, do not contribute to the solution of the problem.

There remains then for the towns recourse either to long aqueducts, bringing water from the hilly regions, or deep wells.

For example, the town of Cremona stands at least 40 kilometres from any possible hill supply, so that on the ground of expense, recourse to deep borings appeared the only possible way out of the difficulty. The first attempt was made with the idea of obtaining an artesian supply to obviate the necessity of pumping, especially as similar attempts had met with success no further away than Mantova. Though water was struck, it did not rise to the surface and did not appear to be plentiful, save near the surface. The project was then abandoned for a time after boring 233 metres (Grasselli) [3]. Fresh borings later showed water at 40 and 100 metres, not rising to the surface, with an objectionable odour and taste and of a turbid character. Finally, twelve trial borings cleared up the situation. It was found that there were four main water bearing strata, and some minor ones of poor yield :—

- (a) A superficial met with at 3 to 6 metres from the surface, of good physical character, but apt to be polluted, as in general it was not protected by an impervious stratum.
- (b) A medium at 16 to 22 metres from surface, also physically of good quality, but apparently not protected, and from its chemical composition, probably related to the superficial water.
- (c) A deep well at about 40 metres from the surface, 2 metres above sea level, protected at 26 to 29 metres from surface by a bed of clay. This water rose to within 4 metres of the surface, was chemically and bacteriologically pure, but became turbid on standing. It contains iron to the extent of 0.2 to 0.5 parts per 100,000. It has also a slight odour of hydrogen sulphide. Temperature  $13.4^{\circ}$  to  $13.6^{\circ}$  Cent.
- (d) A very deep well at 100 metres covered with 10 metres of clay. This does not become turbid as it contains practically no iron, but it smells and tastes of hydrogen sulphide. Temp.  $14.6^{\circ}$  to  $14.8^{\circ}$  Cent.

Choice fell finally on the 40 metre water, as it was found that by pumping to an elevated tank, from which it was distributed in a fine spray to a lower one, the sulphur gases passed off into the atmosphere (a very distinct odour of  $H_2S$  is felt on entering the hall containing the purification plant).

The same process causes precipitation of the iron salts and aeration of the water, while subsequent passage through "Bollmann" filters of siliceous sand removes the iron so efficiently that none is detectable in the town supply by the ordinary tests. The present water supply is derived from five wells sunk through the alluvium on which the lower part of the town stands, the

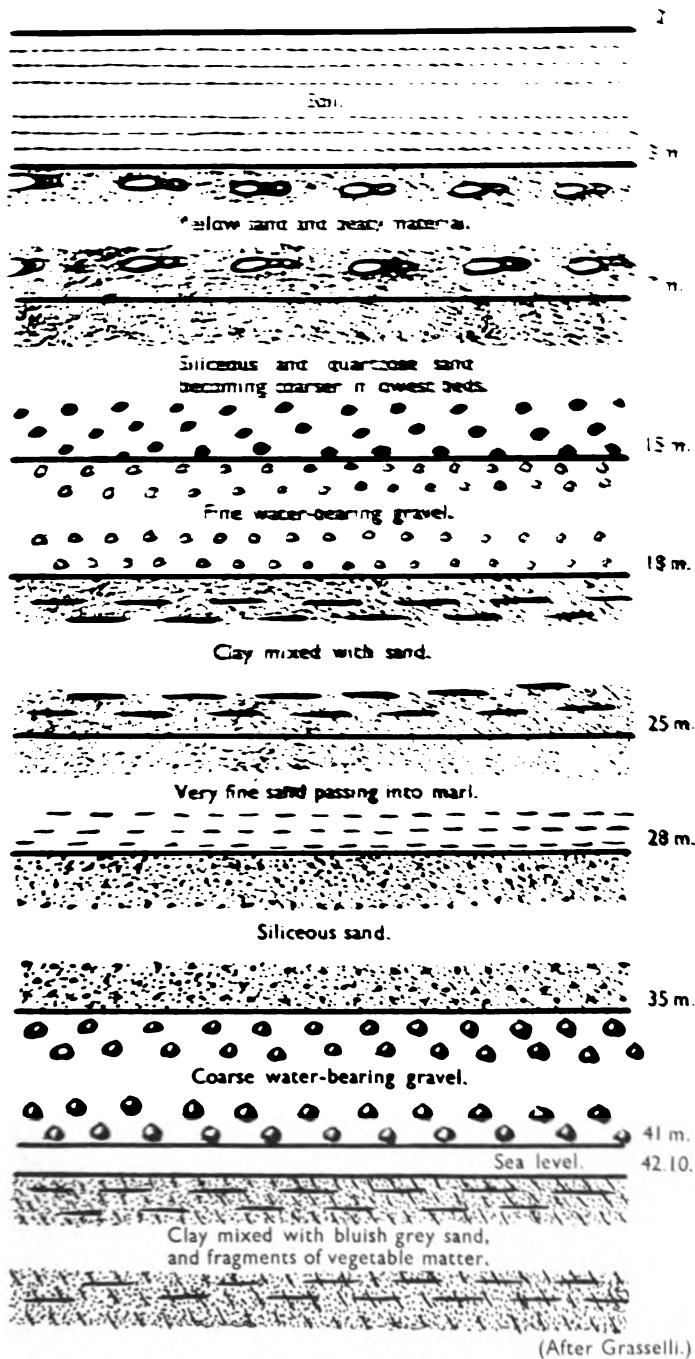


FIG. 3.

higher portions being on the "diluvium recente." After being freed from iron it is pumped to a high level cistern for distribution. From the accompanying section (fig. 3) it will be seen that the soil through which the bore passes is composed of alternating layers of sand, gravel and clay and a similar structure has been met with to the greatest depths reached.

Comparison of a series of sections compiled from the results of fourteen borings by Augusto Stella [4] indicates that these beds are not laid down horizontally but in a lenticular form. Hence the disposition of the beds of coarse sand and fine or coarse gravel in which water is found are struck at varying distances above or below sea level. Constantly, however, water is struck at 20 to 30 metres above sea level, as a rule in sand or gravel, but in few cases is a layer of clay met with in reaching it, hence it is unsuitable as a supply, presumably being subject to admixture with the ground water.

Between 10 metres above and 20 metres below sea level there is also constantly reached the bed of water bearing gravel or coarse sand from which the Cremona supply is drawn, and in every case a bed of clay has been pierced in drilling to it.

Three wells strike another water bearing bed at depths of 40 to 60 under sea level, while one has reached water again at 100 metres.

#### NATURE OF SUB-SOIL.

Sand is the chief component of the sub-soil with lenticular masses of gravel and clay and these deposits are met with to the greatest depth so far reached in the Cremona region, 233 metres.

The sole difference passing from surface to the depths is that the yellow colour of the sand after the first water bearing stratum has been traversed becomes greyish or greyish green. Water percolating from the surface has been gradually deprived of its atmospheric gases and loses its oxidizing power, hence the difference in the deeply buried sediments.

The sand is of varied origin, but largely composed of quartz with more or less mica and calcareous material. Calcium carbonate is at a minimum in the coarse sand, while the percentage rises in the finer to a maximum in the more clayey sands.

The clay is usually sandy and only exceptionally, as in the layer 10 to 20 metres above sea level, is it clay in a strict sense. Speaking generally, it is calcareous clay or marl.

The gravels, especially the fine, contain a fair amount of calcareous material with occasional pebbles and greenish concretions of this nature. At all depths the gravels and pebbles indicate by their appearance derivation from pre-alpine and interalpine regions (basins of Oglio and Adda) and consist of quartz, gneiss, mica schists, tonalite and serpentinite, while the secondary rocks are represented by limestone pebbles, variegated schists, sandstones and flints.

Traces of vegetable remains are occasionally met with indicating old lake deposits and peat formation.

*(To be continued.)*

## Editorial.

### NUTRITIVE VALUE OF WHITE FLOUR.

IN the September number of the *Journal*, 1940, we wrote an Editorial on food, and gave the recommendations on bread of the Accessory Food Factors Committee of the Lister Institute and the Medical Research Council. They suggested that flour for the bread of the people should contain the germ of the wheat grain, as much as possible of the aleurone layer and the finer portions of the bran. The flour should be extracted to the extent of 80 per cent, instead of 73 per cent as at present. The flour must not be bleached or improved by oxidizing agents. They thought the public would benefit by the addition of calcium to the flour from which bread is made. The use of baking powder should be discouraged.

The Ministry of Food proposed to reinforce white bread by the addition of Vitamin B<sub>1</sub> in order to make its nutritive value more nearly equal to that of wholemeal. Ordinary straight-run flour, 73 per cent extraction, is not only poorer than wholemeal flour in Vitamin B<sub>1</sub>, but also has a lower content of B<sub>2</sub> vitamins, minerals and protein. Further, experiments carried out in the Division of Nutrition, Lister Institute, have shown the combination of proteins in wholemeal flour have a higher nutritive value for growth, weight for weight, than those of the endosperm. Vitamin B<sub>2</sub> complex includes : (1) riboflavin, (2) nicotinic acid, (3) vitamin B<sub>6</sub> and (4) the substances grouped under the name "filtrate factor." One of the "filtrate factor" group has been isolated in a pure state as pantothenic acid ; this group also contains substances known to be connected with the prevention of certain forms of anæmia. The inferiority of white flour in vitamin B<sub>1</sub> is generally accepted, but its inferiority in vitamin B<sub>2</sub> is not so widely conceded. Dr. Harriette Chick has demonstrated this inferiority in a series of experiments with groups of rats. She compared the nutritive values of white and wholemeal flour when the deficiencies of the former in vitamin B<sub>1</sub>, in fat soluble vitamins, in protein and in minerals were made good, but any deficiency in B<sub>2</sub> vitamins was uncorrected. Two diets were arranged consisting as largely as possible of white flour and wholemeal flour respectively, with the addition of a salt mixture to remedy the known defects of cereals in this respect, and of extra protein in the form of casein to bring the amount of protein up to the optimum proportion for the growing rat. The samples of wholemeal flour and straight-run white flour (73 per cent extraction, generally used for making bread) were obtained from the same grist. Pure vitamin B<sub>1</sub> in optimum amount was given to the rats on the white flour diet, so that the rats received 3 international units per head daily. This is an optimum for B<sub>1</sub>, so that any inferiority in the rats on white flour could not be attributed to lack of B<sub>1</sub>.

The rats receiving the wholemeal flour obtained their vitamin B<sub>1</sub> from it, and any other vitamins of the B<sub>2</sub> complex which might be present; any superiority which they might show over the rats receiving the white flour must be attributed to their higher intake of vitamin B<sub>2</sub> complex, or some other unknown factor. During the first two weeks the average weekly weight increase on the white flour (11.8 weekly) was about half that on the wholemeal diet (22.8 weekly). The food intake in the former case was also less, the average being 35.3 g. dry weight of food, as compared with 53.2 g. on the wholemeal diet. The digestibility of the white flour was superior, the weight of faeces passed being about a fifth of that on the wholemeal diet, but the utilization of the assimilated food was inferior. The average weight of dry food ingested during this period of two weeks corresponding to 1 g. increase in body-weight was 3.02 g. on the white flour diet, while on the wholemeal diet it was 2.47 g. When allowance is made for loss in the faeces, these figures become 2.91 and 2.13. At the end of the second week the diets were changed: in the next two weeks the rats previously taking diet 1 received diet 2. They made an immediate spurt in growth, with average weekly weight increase of 24 g., while those changed from diet 1 to diet 2 suffered an immediate check, the average increase falling to about 7 g. per week.

Dr. Chick considers that the inferiority of white flour must be attributed to a shortage of B<sub>2</sub> vitamins. Further work is now in progress to determine in which constituents of this complex white flour is most seriously deficient. Preliminary trials indicated that in diet 1, deficiency of riboflavin was probably the most serious, though lack of "filtrate factor" may also have limited growth. It is not likely that lack of vitamin B<sub>6</sub> was responsible, for cereals are known to be good sources of this vitamin, which is distributed throughout the grain. Its presence has been demonstrated in starches of cereal origin, even when these have been highly purified.

Some will still doubt whether a diet that promotes growth in a young animal will necessarily promote the well-being of a human adult who is no longer concerned with growth but with doing a day's work. In the study of nutrition, growth is generally used as an index to show whether an animal is adequately nourished. The vitamins required for growth in the young and for maintenance in the adult are the same. The young and the adult require the same nutritional elements except that the young need relatively more of them. Adults have to balance the continuous process of loss or gain of nutritional elements in their tissues; the young have to do the same, but in addition have to put down new tissues. It may safely be concluded that if one diet does not enable the young to grow while another does, this is also more nourishing for an adult. If the experiments on rats are accepted as applicable to man they must be regarded as indicating that wholemeal bread will lead to better health and economy in foodstuffs, more particularly for the growing child as well as for women and men.

## Clinical and other Notes.

### A CARD INDEX SYSTEM FOR OFFICE RECORDS IN GENERAL HOSPITALS.

BY LIEUTENANT-COLONEL R. A. HEPPLÉ, M.C.,  
*Royal Army Medical Corps.*

DURING the war of 1914-1918 the writer was for a period Registrar of No. 8 General Hospital in France. During this time a card index system of keeping hospital records was evolved which was found to be of very considerable assistance. Subsequently this method was adopted by all the hospitals in France for the remainder of the war. While serving in the present war at G.H.Q., the writer brought the matter to the notice of Major-General J. W. L. Scott, D.S.O., K.H.P., D.M.S., B.E.F., and at the request of the latter, a short talk on the question was given to O.s C. hospitals in the Dieppe Sub-Area, in November, 1939. As a result the system was adopted by the hospitals in the Dieppe Area, and subsequently in the Boulogne Sub-Area, and L. of C. hospitals. An initial supply of cards was printed locally, and subsequent supplies were obtained from the G.H.Q. Printing and Stationery Department.

Reports on the working of the system were asked for early in May, 1940, but owing to circumstances with which we are all familiar, such reports were never received. From conversation, however, with several O.s C. hospitals and Registrars, it was apparent that the method solved several difficulties encountered in record keeping in General Hospitals on active service, and it is felt that it might be desirable to place the details on record.

Briefly the system was as follows :—

The card employed embodied all the items in the A. and D. Book, and the layout was as follows :—

SERIAL NO.....	NAME.....		
REG. NO.....	RANK.....	UNIT .....	
COY. BTY. OR TROOP.....	AGE.....	RELIGION.....	
SERVICE.....	SERVICE IN (FRANCE).....		
DATE OF ADMISSION.....	WARD.....		
DIAGNOSIS .....			
DISPOSAL AND DATE.....			
REMARKS .....			

A card was completed for each patient on admission to hospital. Two filing cabinets were obtained, a small one for the cards of all patients actually in the hospital, and the other (much larger) for patients who had left hospital. (No great expense need be involved for filing cabinets: they can



be constructed by any local carpenter.) Cards were transferred from the small to the large cabinet when a patient was disposed of.

The space for the name was placed on the right hand corner of the card to facilitate collation and allow rapid tracing of any individual.

One clerk was definitely detailed to see that all cards were properly arranged and collated at all times.

Some of the advantages of the system were found to be :—

(1) As soon as the card is completed it forms a permanent record. The card never leaves the hospital office.

(2) An inquiry as to whether an individual is in the hospital, or has ever been in it, can be answered at once. Such an answer is quite impracticable if the A. and D. Book only is available, and the A.Fs. I. 1220 do not help as they are forwarded to the War Office as soon as possible after a patient is disposed of.

It was also found that the re-addressing of correspondence for patients who had left hospital was considerably facilitated by the use of the cards.

(3) It is possible to employ several clerks at the same time in making nominal rolls, a procedure which is not possible if the A. and D. Book only is available. Let us take the following actual example : A number of patients are proceeding to Convalescent Depot, others are being discharged to Base Depot, while a third party is being embarked on Hospital Ship. On receipt of the rolls from the wardmaster, each clerk detailed selects the cards required for his party from the small cabinet, and proceeds to make out the appropriate nominal roll, without in any way hindering the others.

(4) The cards can be quickly sorted in any way desired and nominal rolls made out accordingly. Head wounds, fractured femurs, mental cases, special types of medical case, etc., can be grouped on the nominal roll with a minimum of effort. It would appear that this would be of value in the distribution of convoys received from overseas.

Again, in furnishing A.F.W. 3110 to the D.A.G., 2nd Echelon (or 3rd Echelon in the war of 1914–1918) it was found to be a simple matter to furnish the return by regiments. This facilitated the work of the Echelon and was favourably commented on.

(5) The remarks column can be used for such entries as “A.F.B.117 rendered,” “Medical Case Sheet accompanied patient,” etc. It was the custom to mark such items as “PRISONER,” “MENTAL CASE,” “SELF INFLICTED WOUND,” in red ink at the top of the card.

Rubber stamps “No. ? Convalescent Depot,” “Hospital Ship ‘St. Andrew,’ ” etc., were purchased and used to denote the patients disposal of on the card.

*Procedure on taking in a Convoy.*—It is perhaps desirable to consider the method employed in taking in a convoy of sick and wounded with particular reference to the employment of the cards.

One must refer to the method employed in maintaining a record of the bed state :—

A smooth piece of wood (about 2 feet by 1½ feet) was taken, and a series of nails driven through the wood to project on the other side. Each nail represented a ward, and the appropriate letter (or number) of the ward was printed beside each nail (*see diagram*).

*A	*B	*C	*D	*E	*F
*G	*H	*I	*J	*K	*L
*M	*N	*O	*P		

On each nail, slips of paper, each representing a vacant bed, were impaled, i.e. if there were 15 slips on the "A" nail, there were 15 vacant beds in Ward "A." The slips were, of course, marked with the ward letter. It was the responsibility of the Chief Wardmaster to ensure that this board was always kept up to date.

More elaborate forms of such a board have been employed, but the above is simple and satisfactory.

The officer receiving the convoy had the board on a table beside him. The clerks on duty were each given a supply of cards. One, or perhaps two clerks would be detailed to take particulars of stretcher cases, while the other clerks were seated at a table to take particulars of walking cases.

The officer, having seen the patient, wrote the diagnosis (or provisional diagnosis) on the appropriate slip. The patient, if a walking case, passed on (with the slip) to the clerks' table, where his card was made out. When a sufficient number of patients for any one ward had collected, they were conducted to the ward by an orderly.

If a stretcher case, after the card had been completed by the clerk detailed, the slip was handed to one of the stretcher bearers, and the patient taken to the ward.

When the taking in of the convoy was completed, the cards were collected from the admission clerks, and A.Fs. I. 1220 and the A. and D. Book completed from the cards.

The cards were then placed in their appropriate places in the small cabinet.

My thanks are due to Major-General R. W. D. Leslie, *O.B.E., K.H.P., D.D.M.S.*, Northern Command, for permission to forward this article for publication.

## A CASE OF LOOSE BODIES IN BOTH ELBOW JOINTS, WITH A HISTORY OF AN UNUSUAL ACCIDENT.

BY LIEUTENANT-COLONEL J. C. ANDERSON,

*Royal Army Medical Corps.*

THE patient was a powerfully built young man, aged 24, weighing 14 stone. He was a splendid type of man, a recent voluntary recruit, who was particularly anxious to continue his military service. He gave no history of previous illness or accident.

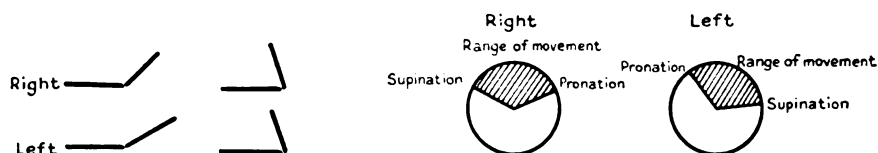
His civil occupation had been that of an overhead transmission linesman.

At the end of August, 1939, the belt by which he was suspended from the wires broke; he managed to catch hold of the wires and clung to them for a period of about eight minutes before being rescued by his mates. As he clutched the wires he wrenched his arms to a certain extent. His position during the eight minutes was precarious, as there was a drop of eighty feet below him.

After the accident his arms ached. He visited a "manipulative surgeon," who gave him a "good manipulation" and local application of ointment. He received no other treatment. He was off work for five days and then continued with his full occupation until the time of his enlistment. The only trouble experienced was the fact that he could not quite straighten his elbow joints. When he got slight electric shocks, quite a common experience in his occupation, the function of his arm improved temporarily. The question of compensation did not arise, as he felt that he had escaped an accident rather than that he had had one.

The condition of his arms was noticed by the medical officer of his unit during routine medical examination of recruits on November 27, 1939.

On examination, the region of both elbow-joints were visibly and palpably enlarged to a moderate extent. Palpation revealed a bony swelling on the posterior aspect of the right elbow between the humerus and the head of the radius. Another vague bony swelling could be felt on the antero-medial aspect of the joint. No definite bony irregularity could be felt on the left elbow. Movements of the elbow-joints can best be shown diagrammatically.



The X-ray appearances were rather unexpected. Others of his joints proved to be normal when X-rayed.

I find it hard to believe that the multiple loose bodies could be a result of his accident in August. At the same time it is doubtful whether a 14-stone man could have hung by his arms for eight minutes if such lesions were present. The explanation that I offer is that as a result of the overstretching, blood was extravasated into the joints, and that the loose bodies are a result of calcification of hæmarthrosis.

I take the liberty of quoting freely from a letter written to me by Mr. H. A. T. Fairbank, who has kindly examined the films and expressed the following opinion:

"... I am much interested in the films you sent me. I think one must certainly class this case as one of osteochondromatosis and, in my opinion, the loose bodies are not simply the result of trauma. By osteochondromatosis I mean a condition where there is an inherent tendency to the formation

of multiple loose bodies in the joint, most commonly, of course, the knee, but the elbow comes second. A history of trauma is common, but there is something more behind it in the way of a neoplastic tendency, though I don't think that the loose bodies are necessarily present before the injury. Most people, I think, believe that the bodies are formed in the synovial membrane

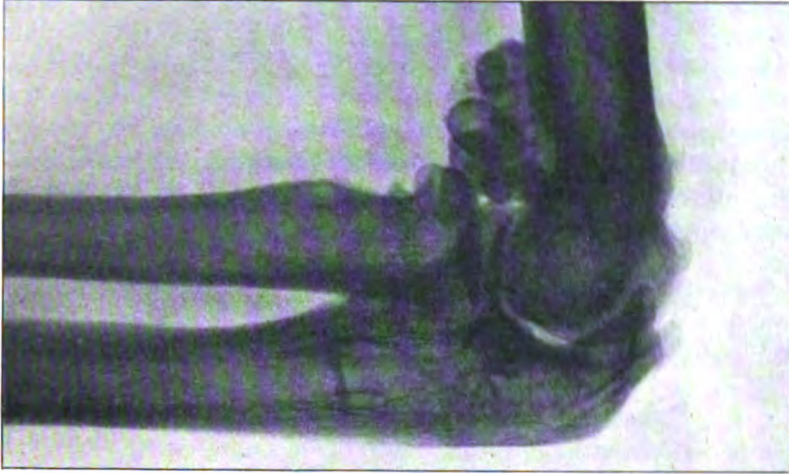


FIG. 1.—Lateral view. This shows the peculiar rod-like opacity in the upper end of the ulna.



FIG. 2.—Antero-posterior view. This shows numerous spherical shadows in the elbow joint. The appearances are similar in both elbow joints.

and later are extruded into the joint. I don't much like the suggestion that they arise in extravasated blood. I have seen a case following a sudden strain when a lad was hanging on the rings in a gymnasium, but that case was not of this multiple type. The point that has struck me very much is that in spite of the loose bodies the joint is remarkably clean and free from arthritic lipping. This case is exceptional in showing definite lipping.

"There seem to be two types, giving different radiological appearances. In one, as in your case, the bodies throw an oval or circular shadow with a fairly definite outline (possibly these are the laminated type which Timbrell Fisher speaks of); in the other the shadows are irregular and spicular with a very indefinite outline. This is the type, I think, which at operation shows the bodies to be largely cartilaginous, very nodular on the surface like blackberries, with an irregular calcified or ossified nucleus. In this type, there are cobweb-like vascular adhesions holding the loose bodies together, and to the synovial membrane, so that they are not really completely mobile. This possibly accounts for the absence of arthritic change.

"I am interested in that curious rod-like opacity in the upper end of the ulna in both arms. Just an anatomical peculiarity, presumably. I have seen these spots at this site, but I don't remember such an obvious 'rod' of bone."

---

### RHEUMATIC MANIFESTATIONS FOLLOWING RUBELLA.

By MAJOR IAN MURRAY.

*Royal Army Medical Corps.*

REPORTS have been appearing recently regarding rheumatic manifestations following rubella. Since the considerable epidemic during last winter, such manifestations appear to have been not uncommon, although most previous authorities seem to agree that rubella is, normally, singularly free from complications. Majors Bennett and Copeman (*B.M.J.*, 1940, *i*, 924) have recorded a series of cases in which very definite complications, chiefly of a rheumatic type, were encountered. In view of the interest which has been taken in this matter, it appears worth while to record the following two cases :—

Private C. was admitted to the Military Hospital, Edinburgh, on May 20, 1940, suffering from typical rheumatic fever. The knees and ankles were swollen and very tender. The temperature on admission was 100° F. The pulse was irregular and the rate 44. Three weeks prior to his admission, he had developed rubella and was for two weeks in an isolation hospital. He had been back at his unit for one week before he developed the signs of acute rheumatism. He was given sodium salicylate, and his temperature became normal after two days. The pulse remained markedly irregular, every third or fourth beat being dropped. A systolic murmur was heard at the apex with the systole immediately following a dropped beat, but otherwise the heart sounds were pure. An electrocardiogram was taken on May 22, 1940, with the following results :—

Vent. rate—irregular.

Mechanism—sinus arrhythm with sino-auricular block.

Axis—no axis deviation.

P waves—upright in all leads.

PR interval—20 second.

QRS complex—upright and varying in lead III.

T waves—upright in all leads.

Chest leads—sternal lead shows slight elevation of ST segment ;

T upright. Apical lead within normal limits.

Summary : Sinus arrhythmia with sino-auricular block.

The complete absence of a whole auricular and ventricular complex is seen in all the leads.

Although the pulse did not alter, he complained of no symptoms and had no further pain, and when he was transferred to a civilian hospital on June 6, 1940, he stated he felt extremely well.

Private D. In January, 1940, after eight days' Army service, this man developed rubella and was admitted to an isolation hospital. He gave no history of any previous illness. Two weeks later he developed rheumatic pains and was kept for a further fortnight in that hospital. Thereafter he was transferred to a civilian convalescent hospital where it was noted that a systolic murmur was heard at the base of the heart. The man himself had no further complaint of pain. For rather more than three months he was kept there, most of the time in bed. He was sent to me and I examined him on June 9, 1940. He was complaining of breathlessness and palpitation on exertion. A systolic murmur was heard at the pulmonic area, but there was no cardiac enlargement and no evidence of any organic lesion. He was a typical case of effort syndrome, and he was transferred to a rehabilitation centre. This case provides an interesting sidelight on the production of the effort syndrome.

---

## BERMUDA VOLUNTEER RIFLE CORPS FLY TRAP.

BY MAJOR J. E. BROOKS,

*Royal Army Medical Corps.*

THE following modifications of the box fly trap, described on page 143, Army Manual of Hygiene, have been made by the Bermuda Volunteer Rifle Corps.

Many experiments were made with the box trap before the final product was evolved. The great objection to the box fly trap was that it was extremely difficult to kill off the flies and dispose of the bodies. If flit was used, no flies would come near the trap for days. Pouring boiling water over it caused the wires to rot.

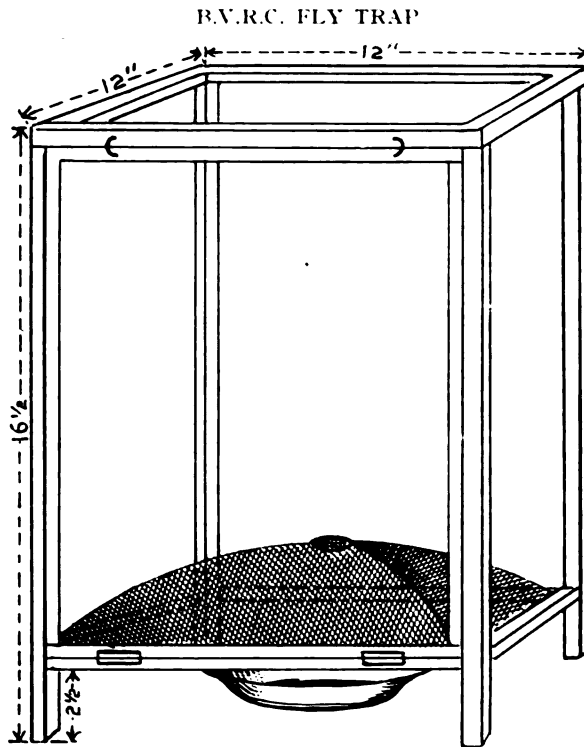
The fly trap now described overcomes these difficulties.

Important points in the construction are the wire cone in the base with a circular opening at the apex of the cone, the door on one side to open

outwards for emptying the flies, and the legs which should be a minimum of  $2\frac{1}{2}$  inches from the ground.

In use a plate with some attractive bait—jam has proved most effective—is placed under the centre of the cone and level with the base of the frame. After feeding on the bait flies fly upwards and enter the trap. The slightest disturbance of the plate causes the flies to rush upwards and there is a mad scramble to get through the hole in the cone. When full the flies can be killed by simply placing over the ring of a stove.

The attached plan clearly shows the effectiveness of this trap.



Wood used	1-inch $\times$ 1-inch Dressed Spruce
Wire	Fine mesh copper
Cone	4-inches above cross struts
Cone Opening	1-inch to $1\frac{1}{4}$ -inch in diameter
Soup plate found best container for bait	

I have to thank Lieutenant-Colonel A. T. Gosling, Commanding Bermuda Volunteer Rifle Corps, for permission to submit these notes for publication in the Corps Journal.



## AN UNUSUAL CASE OF VON RECKLINGHAUSEN'S DISEASE.

BY CAPTAIN R. J. MCGILL,

*Indian Medical Service.*

THE accompanying photographs illustrate a case of von Recklinghausen's disease in a dhobi, I.H.C., aged 42.

Every part of the skin, except the palms and soles, is thickly studded with sessile or pedunculated tumours, large and small, varying in size from a pea to a golf ball. Even the face, including the eyelids, and the scalp are involved. The tumours are soft, elastic and painless.



The photographs show large patches of leukodermia on the left shoulder and left lower abdomen.

The tumours show no evidence of malignant change and an X-ray of the chest revealed no bony erosion, such as results from a neurofibroma of an intercostal nerve. No mucous membrane is involved, there is no excessive pigmentation, and he is mentally normal. There are no symptoms of neuritis such as would result from involvement of a nerve, and no peripheral nerve is perceptibly thickened.



The condition has remained unchanged throughout his life and there is no familial incidence.

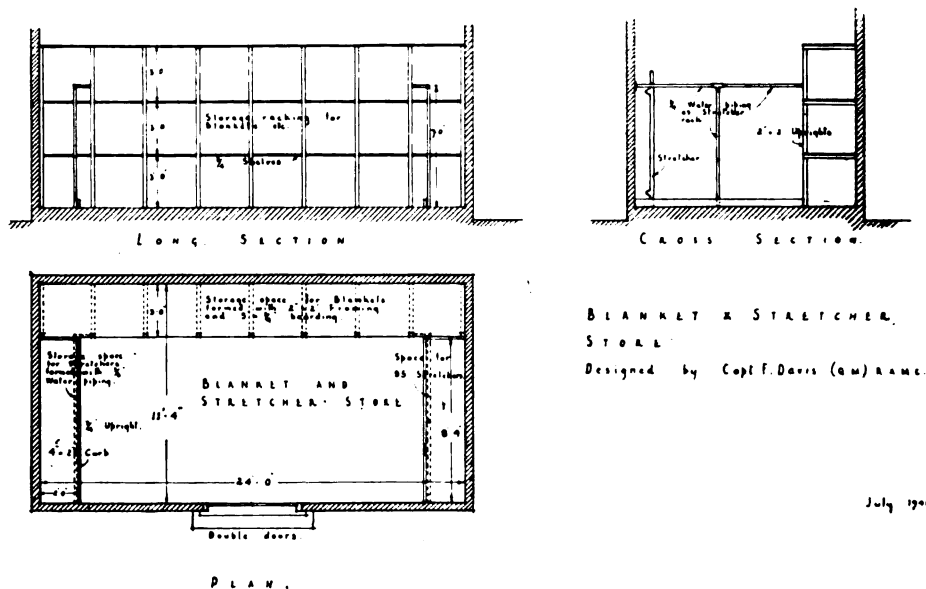
The interest in this case lies not so much in its comparative rarity as in the extensive distribution of the tumours.

### A NOTE ON THE STORAGE OF BLANKETS AND STRETCHERS AND A SUGGESTED METHOD FOR EASIER AND NEATER PACKING.

BY CAPTAIN (Q.M.) F. DAVIS,  
*Royal Army Medical Corps.*

THROUGHOUT a long experience it has been frequently, and sometimes painfully, brought home to me that blankets and stretchers—probably the most essential of all Corps equipment—can be very stubborn, awkward and untidy things if not kept within bounds.

It was, therefore, a pleasure to be asked by the Royal Engineers, some months ago, to make a drawing of the fittings necessary to make a small



July 1900

Hut for Blanket and Stretcher Store.

and newly-built hut into a blanket and stretcher store, with emphasis on "efficiency with economy."

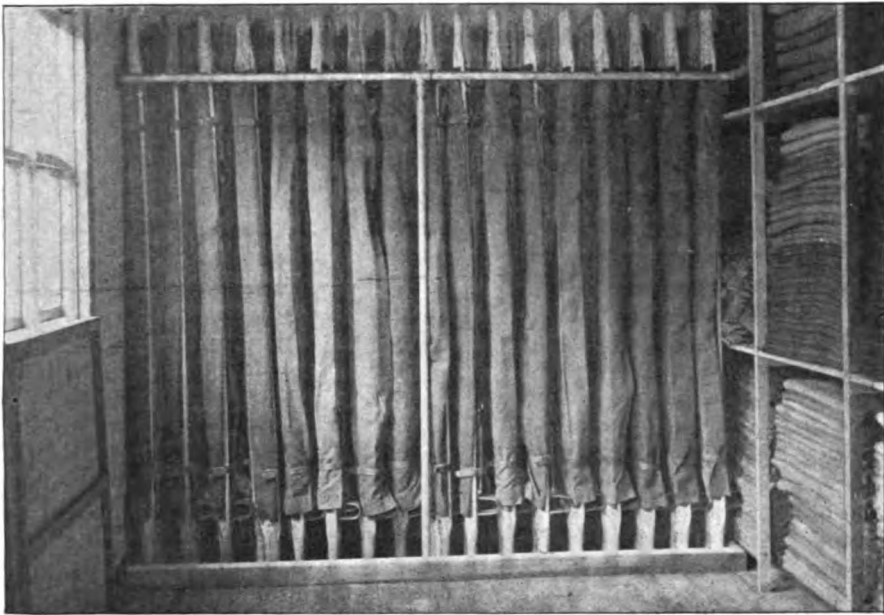
The hut was built with its length parallel to a road from which it was entered by double doors, and the internal measurements 24 by 11½ feet

gave 272 square feet of floor space. The numbers required to be stored were—blankets 500, and stretchers 170, together with slings and pillows.

To accommodate the blankets, pillows, and slings, a wooden rack 3 feet deep was built along the whole length on the side opposite the doors, the framework being of 2 by 2 inch material, forming 3 feet square bays with 2 floors of 5 inch by  $\frac{3}{4}$  inch boards.

This proved to be quite strong and large enough for the purpose.

A stand for the stretchers occupying 2 by  $8\frac{1}{2}$  feet floor space at each end of the hut was made with  $\frac{3}{4}$ -inch bore galvanized water piping in the shape of a large T,  $8\frac{1}{2}$  feet long and 7 feet high, and fixed with three socket bolts to rack, wall and floor, so that the top bars ran parallel to, and 2 feet from



Stand for Stretchers.

the end walls, the supporting bar being perpendicular from floor to upper bar. (The central fixing or formation being made with a "T" piece.)

A wooden curb 4 inches high and fixed to the floor to correspond with the cross bar above and "returned" to the side wall at its angle with the blanket rack completed the stand.

In each of these stands stretchers were placed upright five deep in 17 rows; in short, 85 stretchers in a floor space of sixteen and two-thirds square feet.

They are easily packed, and even more easily taken out, falling naturally on the shoulder in the carrying position.

Of the 272 square feet of floor space available, less than 110 square feet

was occupied ; this left ample room for a clerk's table and chair, and allowed for a party of men to file in and out for stretchers or for folding of blankets.

To extend the space for stretcher storage the rail and curb could be unscrewed and refixed where required, or better still, provide another rail and curb. For example, if a space of 6 by  $8\frac{1}{2}$  feet were used at each end of the hut, 510 stretchers could be stored, and this would leave a free space of 12 by  $8\frac{1}{2}$  feet in the centre of the hut to work in.

---

### VACCINATION—TREATMENT OF ONE OF THE LATER COMPLICATIONS.

BY LIEUTENANT C. HACKNEY,  
*Royal Army Medical Corps.*

In the vaccination of large numbers of men, there is one complication which will be found to arise in a certain number of cases, i.e. the sloughing of the vaccinated area. This occurs after about a fortnight, and usually in cases which appear to have been getting on all right. The man gets a knock, the whole scab comes away with some necrotic material beneath, and a large raw area is left of about one inch in diameter and of varying depths. This raw area is difficult to heal, and the time usually taken for it to granulate and heal over cannot be spared from the short training time.

One satisfactory method of promoting healing is to treat the wound like the raw area left after a burn. Clean up the raw surface with spirit or ether methylated. Then spread a thick coating of Tannafax jelly over the raw area. Allow this to "tan" properly, then apply a protective gauze covering. This can be repeated the next day. The scab can be left until it comes off by itself, usually on the seventh to the ninth day, when it will be found that the whole area beneath is healed. This treatment has the additional advantage of allowing the man back to full duty after the second application of the "tanning" medium, thus saving valuable time in training.

---

### Current Literature.

COHEN, S. M., and SCHULENBURG, C. A. R. Treatment of War Wounds of the Limbs. *Lancet*, September 21, 1940.

The cases represented a mixed group. Some were wounded in Belgium and France, some were casualties at sea, and the majority received their injuries on the sands at Dunkirk. All the cases had been wounded at least 24 hours before admission to hospital and the majority 40-72 hours previously. The authors treated 266 wounds of the extremities. They regard

treatment of the wound as important. General anaesthesia was usually employed; the routine use of evipan (limited to 10 c.c.), or pentothal, followed by gas and oxygen, was most satisfactory. The wound was covered with a saline swab and the surrounding skin cleaned with ether soap, shaved, and washed with saline. No antiseptics were employed in the wound. Frayed edges of the skin were excised with scissors, and the wound laid widely open by making several radial incisions. Radiating incisions were also made in the fascia. No attempt at trimming or excision of muscle was made; only loose fragments of bone were removed. No trimming or suturing of divided nerves was done. It was found unnecessary to lay through and through wounds widely open; by enlarging the entrance and exit wounds by radiating incisions of the skin and fascia the course of the wound could be readily packed with petroleum jelly. Foreign bodies were only removed if readily accessible. Large splinters were always removed, but no attempt was made to remove the small splinters some way from the wound, and probably embedded in muscle. The disruption caused by a large fragment left a blood-filled space which the entrance wound only partially drained. Counter openings were made so as to drain the lowest part of the cavity.

No antiseptics were used in the wound itself. Two inch gauze roll impregnated with petroleum jelly was used to pack the wound and the surrounding skin was covered with a thick layer applied with a spatula.

A thin layer of plaster wool was placed over the wound, plaster being then applied skin tight. Immobilization of the limb was obtained by immobilizing the joint above and below the injury. Several patients were admitted to hospital with large windows cut in the plaster. All these showed "window oedema," with congestion of the tissues and raised temperature. When placed in a closed case they were comfortable and the temperature subsided. For the application of the plaster a definite technique was devised. The smell from the plaster worried the other patients; pure dettol dropped on the outside of the plaster seemed to have the best effect, but its action is short lived.

All compound fractures were treated in closed plaster. Reduction was obtained by manual traction only. The authors were well satisfied with the alignment and the length of the limbs.

There were 207 wounds involving the soft tissues only and 20 of these were treated with plaster. Where plaster was not used immobilization was assisted by the application of elasto-plaster over the bandage. In lower limb injuries walking was not allowed. The healing of soft tissue wounds treated in plaster was astonishing.

After operation chemotherapy was employed as a routine, with standard dosage. Sulphanilamide was used but was not applied to the wound. Sulphapyridine was reserved for chest wounds.

Of the 266 gunshot wounds of the limbs, 84 were treated in plaster and 54 of these were compound fractures. There were 119 wounds of the upper

limbs and 147 of the lower. There were no deaths and amputation was required in only one case for secondary hæmorrhage from the popliteal artery.

No case developed tetanus or true gas gangrene. In 10 of the cases treated by closed suture before admission severe infection had already developed. The stitches were removed, the wounds widely opened ; petroleum jelly packs were inserted. In spite of the severe sepsis they were treated by the closed method. All the cases did well. The authors state that their results show that even in late cases the closed plaster method is safe and satisfactory. At the end of ten weeks none of the patients was pyrexial, and the general condition was excellent.

**Burns of the Hands and Face.** *Lancet*, No. 23, 1940.

At a meeting of the Royal Society of Medicine it was decided that tannic acid should not be used for burns on the face, hands or feet. The tannic acid causes compression of the vessels in the fingers and toes, and leads to stiffening of the eyelids, which may expose the cornea. In the E.M.S. hospitals the application recommended is tulle gras<sup>1</sup> ; this consists of a curtain net with a 2 mm. mesh soaked in soft paraffin 98 parts, halibut oil 1 part, and balsam of Peru 1 part ; it can be kept in tin boxes and applied directly to the burn. Saline packs can be applied outside it and the saline will penetrate the mesh. First-aid parties are advised to apply either tulle gras or plain sterile dressings.

It is understood that the R.A.F. and Navy propose to use collapsible tubes of a jelly containing 1 per cent of gentian violet and 0.02 per cent of merthiolate. There are objections to the general use of gentian violet. It is not easy to obtain and does form a coagulum, though a softer one than tannic acid. There is no objection to the use of tannic acid elsewhere on the body.

**MCDONALD, R. The Ventilation of Ships.** *J. Inst. Heating and Ventilating Engineers*. 1939, v. 7, 272-95.

The author of this article deals most fully with the important subject of ship ventilation and with the correlative problem of ship heating. The development of the modern passenger ship has created numerous problems for the ventilating engineer due to restriction and congestion on board ship and it is difficult to reconcile ventilation principles ashore with those afloat. Among the problems that arise may be mentioned the difficulty of accommodating ducts and pipes where high 'tween decks are not practicable ; the finding of space to house ventilating fans and motors ; the necessity for not obstructing with ventilating plant, ducts or cowls, the large areas of deck which are required for deck games and promenade space ; and the

---

<sup>1</sup> Tulle gras (lumière), Anglo-French Drug Co. Nouad tulle. Allen and Hanburys.

placing of fresh air fans so as to avoid the spread of obnoxious smells from kitchens, engine rooms, etc.

At one time natural ventilation was all that was provided, even in vessels going to the Far East. Cowl ventilators were large and numerous and skylights and light and air skids were an essential part of the design, with perhaps the provision of rotating propeller fans. As for heating of rooms and corridors, steam radiators, or a continuous piping working at 50 pounds pressure per square inch was considered ideal. Though such conditions still exist on cargo vessels and coasters it is realized that mechanical ventilation should be employed.

It is interesting to note that while the Board of Trade are responsible for the comfort conditions of third-class passengers and crew, there are no rules as regards the ventilation and heating of accommodation provided for other classes of passengers. A third-class passenger is allowed a minimum of 15 square feet deck area and 830 cubic feet of air per hour by mechanical means, with an additional 33 per cent air supply if the accommodation is situated in the bowels of the vessel or adjacent to machinery spaces. In actual practice a figure of 1,000 cubic feet of air per hour per person is allowed as a minimum for third-class passengers and crew which, relative to the cube of the space occupied by the individual, ensures at least eight changes of air per hour. The amount of air supply is usually well above this minimum especially in vessels trading with the tropics.

An advance on the use of high pressure steam heated radiators and pipes was the development of mechanical ventilating systems, the supply fan units incorporating heater batteries and casings so designed to heat the air to the temperature desired in the rooms, *plus* the additional heating necessary to offset the losses through the exposed surfaces of the structure. Such losses are considerable, especially where a vessel encounters conditions approaching zero in the North Atlantic or Baltic, and it may be necessary for air to enter rooms at something approaching 90° to 100° F. to combat such losses. Such a system is, of course, entirely unsatisfactory and it is now realized that it is essential for the heating and ventilating systems to be separate in fact, but to operate together in principle.

Steam heating in modern ships is generally of the vacuum low pressure type, the pressure of steam not exceeding 5 pounds per square inch and the temperature rise being such that the system will be capable of maintaining a temperature of 65° to 70° F. Electric heating has come into more common use of recent years but is confined mainly to passengers' and officers' accommodation—the more simple and the less expensive method of continuous piping without radiators being preferred in crew spaces. Insulating the exposed walls and ceilings of living rooms and public rooms of vessels with 2-inches thick non-inflammable cork against excessive heat losses in winter conditions and heat gains in summer and tropical conditions is a sound investment.

The author discusses in some detail the methods of ventilation of the

various sections of a ship—crew accommodation, passenger accommodation, sanitary services, public rooms, dining saloons, kitchens and dependencies, cargo holds and stores, and machinery spaces—in all of which the ventilation systems are entirely separate though necessarily correlative.

A modern vessel may require anything from 100 to 200 ventilating fans and usually there is great difficulty in placing them to obtain best results without obstructing decks. Further, it is desirable for the motors of the fans to be arranged with the armature shafts in the fore and aft direction rather than athwart-ships to reduce the wear and tear on the commutator end of the motor and to minimize gyroscopic action. Centrifugal cased fans are usually employed because of their ability to handle large volumes of air at various water-gauge resistances with reasonable silence.

Higher air speeds are used by the ventilating engineer in determining the size of ducts in ship ventilation than would be tolerated ashore because of the limited space on board ship and because absolute silence is not of major importance. In main ducts velocities are within 1,200 to 2,000 feet per minute and in branches from 750 to 1,000 feet per minute. The outlets or inlets in rooms of the grating or grille type are designed, if possible, for a velocity of 300 to 500 feet per minute. Ducts are usually made of galvanized sheet steel and, because of the rapid tendency to corrosion due to the effect of salt air and moisture deposit, are of a stouter gauge than applies to ducts of equal size in land work. In vessels trading in the tropics it is considered essential to fit sumps or pockets with drain cocks to drain off the moisture of condensation. Ducts conveying warm air or cooled air are generally insulated with slab cork, magnesia, or asbestos, and where ducts pass through fireproof bulkheads a fire damper of stouter gauge is fitted in the duct on either side of the partition. The Board of Trade now prohibit the practice of allowing ducts to pass through watertight bulkheads or decks and this is one of the reasons why it is necessary to have so many fans on board ship.

Finally, the author makes reference to air conditioning which, though limited at present to a few of the larger vessels, is evidence of the interest now being taken to improve living conditions at sea.

This article is an excellent and detailed account of ship ventilation in all its aspects and a short review of this kind cannot deal with all the points mentioned. The article might usefully be read not only by those primarily interested in ship construction but also by those whose work and interests bring them in contact with ships and life afloat.

M. T. MORGAN.

*Reprinted from "Bulletin of Hygiene," Vol. 15, No. 7.*

## Reviews.

---

**FIELD SURGERY IN TOTAL WARFARE.** By Dr. D. W. Jolly, M.B., Ch.B., N.Z. Late Major, Spanish Republican Army Medical Service. London : Hamish Hamilton, Ltd. 1940. Pp. xiv + 242. Price 10s. 6d.

The publishers worked overtime to get this book out, and it will be surprising if there is not a second edition shortly. I have no hesitation in recommending it to surgeons in the Army, in particular. Those who had practical experience of surgery in the field, and who saw the difficulties which had to be met before the B.E.F. was evacuated from France and Belgium, will, I am sure, readily agree with the author that the keystone in the arch of medical organization in the Axis type of warfare is mobility ! Lieutenant Jolly, for he has been commissioned in the R.A.M.C. since his book was written, had an enviable experience in Spain, and his views will not only command attention, but be worthy of close study. To those readers who may be inclined to exclaim, " A pity this book was not published sooner ! " I would say that it would have made no difference to the Army medical units as seen with the B.E.F., because these had to be built up and mobilized long before the Spanish fighting indicated the ways of those who pin their faith on " total warfare " methods.

Do not fail to read the Foreword by Surgeon Rear-Admiral Gordon-Taylor. The distinguished Rear-Admiral was a surgical specialist in the Army in the Great War, where he learnt to appreciate the problems, and did much toward the common task of solving them.

Section I of the book is worth studying alone. The author describes the " three-point forward system " and the type of " mobile surgical unit " that was ultimately developed. It is now generally appreciated that the whole medical organization in warfare, where wounds and not sickness claim first place as a cause of wastage of man power, must be built round the surgeon as a nucleus, and that the time factor is of such importance that if the wounded man cannot be brought to the surgeon the surgeon must go to him. With air attack so important a factor, both situations demand small mobile units, easily hidden, not large fixed vulnerable units.

Section II deals with surgical technique. Dogmatic in places, it is nevertheless full of useful tips based on practical experience. Plaster technique is prominently featured.

D. C. M.

**TEXTBOOK OF BACTERIOLOGY.** Third edition. By R. W. Fairbrother, D.Sc., M.D., M.R.C.P., Major R.A.M.C. London : William Heinemann (Medical Books) Ltd. 1940. Pp. x + 451. Price 17s. 6d.

This is a very wisely designed book, written for the ordinary medical student. There are always certain students who delight in studying large



tomes or systems of reference and interesting themselves in difficult problems before they have mastered the essential principles of a subject. These may be disappointed in this volume. But for the average hard-worked medical student who wishes to digest a complete introduction to bacteriology, Major Fairbrother has produced one of the best books on the subject.

The layout is not altogether orthodox, but the arrangement adopted by the author has many advantages. The body of the book is practically free from detailed technique and formulæ of media and stains. These are included in a short appendix. There is a pleasing absence of any reference to protozoology, which so frequently creeps into textbooks on bacteriology, and it is so attractively written that the average reader should find no difficulty in studying the book without any effort. This revised edition contains references to most of the recent work suitable for inclusion in a publication of this nature. The only criticism that one can make is that the author is, on occasions, not sufficiently clear in his statements for the inexperienced. For instance, in discussing post-nasal swabbing in the control of cerebrospinal fever (a subject concerning which there is considerable confusion in the minds of many medical practitioners) a more dogmatic statement on the failure of isolation of carriers, as a practical measure, to control the incidence of the disease would have been welcome. Again, in describing the antigenic complexity of the mannite-fermenting dysentery organisms, either an accurate statement of Boyd's classical work should have been given or a much simpler account would have sufficed. The student will find it difficult to appreciate the true relationship of this group of organisms from the description given. These are perhaps small faults to find with a book that is otherwise so generally sound.

The difficulties of the student may be appreciated with long experience of individual teaching, but it is another matter to make all these points clear in writing. The author is to be congratulated on this most excellent book; it can be recommended with confidence to all medical students.

H. J. B.

**SURGERY OF THE HAND.** By R. M. Handfield-Jones, *M.C.*, *M.S.*, *F.R.C.S.*  
Edinburgh: E. & S. Livingstone. 1940. Pp. viii + 140, 95 illustrations (many coloured). Price 15s.

The author in his preface makes the following statements: "I feel that even now the grave implications of infections of the hand do not receive the attention to which they are entitled. Too often they are dismissed as trivialities of minor surgery. . . ." "It is because so many serious infections have trivial beginnings and are allowed to develop by delay in diagnosis and imperfection of treatment that it seems good to put these matters in simple language and in practical detail devoid of unnecessary theory." The former statement is, alas! a reproach which the profession

still merits, and the latter is ample justification for another treatise on the subject. Mr. Handfield-Jones has done the job well: his points are well illustrated, with excellent semi-diagrammatic pictures and well-reproduced photographs.

This book is strongly recommended, and attention is invited in particular to the author's remarks on after-treatment. "No skill can restore function to a hand deformed and rigid from the effects of delayed diagnosis and inept treatment. But, ill-conceived after-treatment can render useless a hand in which prompt diagnosis and efficient treatment had laid the foundations of complete recovery."

D. C. M.

**THE CONQUEST OF BACTERIA.** From 606 to 693. By F. Sherwood Taylor, Ph.D., M.A., B.Sc. London: Secker and Warburg. 1940. Pp. xiii + 144. Price 6s. net.

Following a brief general account of the causative agents of infectious disease and various immunological problems in semi-popular language, the author passes on to the development of synthetic drugs and the rise of chemotherapy in the treatment of bacterial and protozoal diseases.

Adequate tribute is paid to the father of chemotherapy, Paul Ehrlich, but the author is hardly fair to Schulemann and his fellow workers who produced plasmoquine and atebirin, preparations that have been used for the successful treatment of thousands of cases of malaria. The synthesis of these drugs, commencing with methylene blue, remains one of the most interesting examples of substitution chemistry.

Almost half the book is devoted to the sulphonamide drugs derived from another dye, chrysoidin. The amazing activity, as a bacteriostatic, of sulphapyridine, a member of this group, and the publicity given to it in the popular press are perhaps responsible for this lack of balance. It must be remembered that these sulphonamide derivatives are of recent introduction, and it well may be that more potent and less unpleasant preparations will replace sulphapyridine in the future. Already sulphathiazole has been shown to be at least the equal of sulphapyridine in treating some infections and free from some of the unpleasant effects of the latter drug.

The book is full of interest and readable, but it is to be wondered if the atomic patterns and graphic formulæ will be appreciated by readers who have not had a grounding in organic chemistry.

H. J. B.

**A HANDBOOK OF MALARIA CONTROL.** By R. Svensson, D.S.O., M.C., M.B., B.Ch., with a Foreword by Sir Malcolm Watson, LL.D., M.D., C.M., D.P.H., F.R.F.P.S. Published by the Shell Oil Companies.

A most valuable little book intended primarily for the use of planters, engineers and other laymen, who have to undertake anti-malarial work

## Notices.<sup>1</sup>

---

### "WELLCOME" REFINED TETANUS AND GAS-GANGRENE ANTITOXIN GLOBULINS.

WE are informed that Messrs. Burroughs Wellcome are issuing mixed tetanus and gas-gangrene antitoxin for the convenience of those who are called upon to treat wounds contaminated with soil, dust, etc.; this is available as "Wellcome" Brand Refined Tetanus and Gas-Gangrene Polyvalent Antitoxin-Globulins.

Each phial contains 3,000 International Units of antitoxin for *Cl. tetani*, 3,000 units for *Cl. perfringens* (= *Cl. welchii*), 1,500 units for *Cl. septicus* and 1,000 units for *Cl. oedematiens*.

The entire contents of the phial may be injected subcutaneously or intramuscularly as soon as possible after receipt of a wound that may have been infected with pathogenic anaerobes.

---

### "CELLONA" AND THE "CLOSED" TREATMENT OF FRACTURES.

WE are informed by T. J. Smith & Nephew, Ltd., that "Cellona" is now available in sizes 18, 24 and 36 inches wide by 6 or 12 yards. These widths are stated to be most suitable where compound fractures, burns and war injuries are treated by the closed-plaster method, using "Cellona" in the form of slabs. A shoulder abduction or thoraco-brachial plaster can be made from wide "Cellona," which is applied in three slabs to the arm and anterior and posterior parts of the body, each slab being cut from five layers of 24-in. wide "Cellona" material. The application of the plaster is completed and the cast trimmed within 20 minutes; it weighs only 5 lb.

For jackets, fillets, spicas, shells and other large plasters, "Cellona" incorporating a specially strong base cloth is also available in the following sizes: 6 inches by 4 yards, 8 inches by 4 yards, 4 inches by 6 yards, 6 inches by 6 yards, 8 inches by 6 yards.

---

MESSRS. CIBA LIMITED inform us that recent publications include their well-known Handbooks, No. 2, The Percaine Handbook, No. 3, Ciba Hypnotics and Analgesics, and No. 4, The Sex Hormones, second edition, as also a booklet on Coramine. Copies of these publications can be obtained on application to Messrs. Ciba Limited, The Laboratories, Horsham, Sussex.

---

<sup>1</sup> These notices are for the purpose of acquainting officers with the latest developments in therapeutics, but do not imply that the preparations mentioned have been added to the list of authorized drugs.

## Journal

OF

THE

## Royal Army Medical Corps

ISSUED

MONTHLY



EDITOR

COLONEL S. LYLE CUMMINS, C.B., C.M.G.

ASSISTANT EDITOR

LIEUTENANT-COLONEL H. A. SANDIFORD, M.C., R.A.M.C.

MANAGER

LIEUTENANT-COLONEL W. J. F. CRAIG, R.A.M.C.

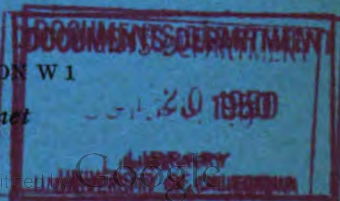
## CONTENTS

	PAGE		PAGE
The Late Colonel Sir WILLIAM HEATON HORROCKS, K.C.M.G., C.B., A.M.S.		Anæsthesia in War. By Major J. M. SAVEGE, M.B., Ch.B., D.A., R.A.M.C. . . . .	107
ORIGINAL COMMUNICATIONS.		EDITORIAL.	
An A.D.M.S.'s Experiences with the B.E.F.—May, 1940. By Colonel C. M. FINNY . . . . .	67	The Bread of the Nation . . . . .	111
A Report on the First Thousand Cases which attended the Ear, Nose and Throat Department of a Military Hospital. By Major DAVID H. CRAIG, F.R.C.S.Ed., R.A.M.C. . . . .	86	CLINICAL AND OTHER NOTES.	
Anti-Scatter Treatments for Window Glass . . . . .	92	A Case of Multiple Bony Injuries of Both Wrists, including a Fractured Cuneiform and Dislocated Semilunar Bone. By Lieutenant-Colonel J. C. ANDERSON, R.A.M.C. . . . .	115
Notes on the Geology of the Quater- nary Deposits of the "Pianura Padana" (Plain of the River Po) with the Results of Bacteriological and Chemical Examinations of some Potable Waters derived therefrom. By P. R. McNAUGHT, M.D., Ch.B., D.Sc.Glasg., D.P.H.Cambridge . . . . .	96	A Case of Malaria, complicated by <i>Salmonella thompson</i> Septicæmia. By Captain J. GOLBA, Polish Army . . . . .	116
		CURRENT LITERATURE . . . . .	118
		REVIEWS . . . . .	124
		NOTICES . . . . .	125

JOHN BALE &amp; STAPLES LIMITED

83-91 GREAT TITCHFIELD STREET LONDON W 1

Price Two Shillings and Sixpence net





## LOCAL ANÆSTHESIA IN SURGICAL PRACTICE

Novocain has been in general use in all the chief Hospitals for over 20 years. Conclusive proof of its efficacy is now to be found in every standard work on Local Anæsthesia.

For every type of MAJOR AND MINOR SURGICAL OPERATION.

Hypodermic Tablets "A" for Minor Surgical Operations.

" " "B" for Block Anæsthesia.

" " "C" for Spinal Anæsthesia.

" " "E" for Dental Extractions.

Solutions in Cartridges, Ampoules and Stoppered or Rubber Capped Bottles.

We invite applications for reports and details of major and minor operations with Novocain.

*Does not come under the restrictions of the Dangerous Drugs Act.*

# NOVOCAIN

*Brand Ethocain  
Hydrochloride*

**The Original Preparation.**

English Trade Mark No. 276477 (1908).

As supplied to the R.A.M.C., War Office, Admiralty, Crown Agents for the Colonies, &c.

*Sold under Agreement*

**The SACCHARIN CORPORATION, Ltd., 72 Oxford St., London, W.1.**

Telegrams: "SACARINO, RATH., LONDON."

Telephone: MUSEUM 8096.

Australian Agents—J. L. BROWN & Co., 123, William Street, Melbourne, C.1.

Please send a postcard or your professional card  
for a clinical sample, and explanatory literature of

## "CURICONES" Anti-Rheumatic Capsules

SUPPLIED TO OVER 6,050 DOCTORS

*(Figures certified by Chartered Accountants)*

**STEPHEN MATTHEWS & CO., LTD.,**

*Manufacturing Chemists and Druggists,*

19/21, FARRINGDON STREET, LONDON, E.C.4.

## CHRISTOPHER & C<sup>o</sup>. LTD.

**WINE MERCHANTS,**

**43, PALL MALL, LONDON, S.W. 1**

**MILITARY MESSES SPECIALLY CATERED FOR.**

**FOR OVER 30 YEARS SUPPLIERS TO R.A.M.C. HEADQUARTERS MESS**

Telephone: WHITEHALL 5557/8.

When writing advertisers please mention "Journal of the R.A.M.C."

THE LATE COLONEL SIR WILLIAM HEATON HORROCKS,  
K.C.M.G., C.B., A.M.S.

EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"  
1908-1940.

It must be very seldom that a scientific journal continues to be edited by the same man for a period of thirty-two years. Yet such has been the good fortune of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

Colonel Sir William Heaton Horrocks was an active Editor from 1908 until the very day of his death on January 26, 1941. He worked with zest and enthusiasm at papers for the Journal on the last day of his life. "In his last years his absorbing interests were the Journal, to which he was devoted, and his garden where he spent endless happy days among his flowers." So writes his daughter; and the Royal Army Medical Corps knows well that his devotion led to a publication not only highly interesting but extremely efficient as well.

Such an Editorship might well occupy the whole time and attention of one man; and yet, when one sets out to read the story of Sir William Horrocks, the Journal appears to occupy a relatively small place in his life and work, so great was the inspiration, the drive and the industry displayed. Let us begin at the beginning and attempt to follow, through the stresses of a long period, the exertions and successes of a thoroughly accomplished and highly efficient officer of the Corps.

Horrocks was educated at Owens College, Manchester, where he matriculated at the age of fifteen and took his B.Sc. He graduated in Medicine later, taking his M.B. of London in 1883.

For a time he was a Resident at the Brompton Hospital for Chest Diseases and then went to the Guildford Hospital. "It was there," says his daughter, "that a purely chance conversation with a patient made him think of the Army and he joined the Royal Army Medical Corps, a step which he never once regretted."

He entered the Army Medical Service as a Surgeon and became a Surgeon Captain on passing out of Netley on February 5, 1887.

While in India in 1895, he married Minna, daughter of the Reverend J. C. Moore of Connor, Co. Antrim. By her he had two children, both of whom survive him, a son, Brian Gwynne, and a daughter, Jean Moore. His wife died in 1921. Their life together had been one of unclouded happiness. The son is now Brigadier B. G. Horrocks, Commanding an Infantry Brigade.

In 1899, Captain Horrocks, who had returned from India and had been posted in 1897 as Assistant Professor of Hygiene to the Army Medical

School, Netley, was promoted to the rank of Major. He continued to be an Assistant Professor until 1903 when he was transferred to Malta and served as a Member of the Royal Society's Commission on Mediterranean Fever.

"Malta Fever," "Mediterranean Fever," "Undulant Fever"—the disease is really an almost universal scourge—was then known principally as a disease of Malta and, as such, had long defied all efforts to check its prevalence. Excellent accounts of it had been written by various doctors. Its causative organism had been isolated by Colonel David Bruce. Everything seemed set for the rapid termination of the infection. And yet the disease continued.

The Mediterranean Fever Commission, working under a distinguished Chairman, Colonel Sir David Bruce himself, at once embarked on many lines of research. The Members, including Major Horrocks, Captain Crawford Kennedy, Dr. T. Zammit, Staff-Captain E. A. Shaw, R.N., and others detailed from time to time, did wonders of bacteriology in the study of how the *Micrococcus* (now *Brucella*) *melitensis* escaped from the infected human body, whether it could be transmitted by mosquitoes, whether lice or other ecto-parasites might play a part. Monkeys were found to be very susceptible and were proved to be readily infected by the gut or by injection.

But it was not until Horrocks and Zammit started to investigate the Maltese goat and proved, with the help of Captain Kennedy, that about 41 per cent of these animals were able to agglutinate the germ and that 10 per cent passed it in their milk, that the disease was really brought under control.

Nothing in epidemiology is more striking than the contrast between the incidence of Malta Fever before and just after the stoppage of the supply of goats' milk to the Garrison and the Military Hospitals of Malta.

In 1908, he demonstrated the passage of anthrax bacilli into the milk of a cow dying of the disease and was able to bring about a similar condition in a female goat to which the disease had been transmitted. He had also published in the *British Medical Journal* (1900) a paper on the agglutination test as a means of diagnosis between *B. typhosus* and the coliform organisms; in the *Journal of Hygiene* (1901), "A Comparative Study of the Varieties of *B. coli* isolated from Typhoid and Normal Digesta"; in the *British Medical Journal* of 1902, "An Enquiry into the influence of Soil, Fabrics and Flies in the Dissemination of Enteric Infection," written with Colonel Firth; and, from the start of the *Journal of the R.A.M.C.*, a number of articles from 1904 onwards, on the activities of the Mediterranean Fever Commission, enteric fever, and other subjects of first-rate importance to the soldier. While Assistant Professor of Hygiene, he published his "Introduction to the Bacteriological Examination of Water," for long the standard work on the subject. He edited, with Colonel Firth, Parke's "Theory and Practice of Hygiene," and the second edition of "Notter and Firth." In 1914, he became a King's Honorary Surgeon. He was awarded the Chadwick Gold Medal and Prize of £50 in 1915.

But it was in the preparation for and the actual waging of the War of 1914-18 that Horrocks found his greatest role.

As a Member of the Army Medical Advisory Board, Member of the Army Sanitary Committee and Chairman of the Anti-Gas Committee, he played a conspicuous part in some of the major episodes of the War.

In his capacity of Member of the Army Sanitary Committee, he co-operated magnificently with those responsible for the sanitation of the Armies in France and Belgium. He was instrumental in sending out the Mobile Water Sterilizers, the Mobile Hygiene Laboratories, in the supervising and altering of the Water Carts, and in the issue of the Test Case for Water Supplies, now universally known as the "Horrocks Box." This Test Case "contains a graduated pipette, a standard spoon, one cup holding 250 c.c. of water, six cups containing 187 c.c. of water, and a test solution of zinc iodide and starch. The pipette is so graduated that one drop of a solution containing the contents of the standard spoon in 250 c.c. of water when added to 187 c.c. of the water to be tested, produces 1 part per million of free chlorine; and one standard spoonful of chloride of lime in 110 gallons of water, the contents of one water cart, produces approximately the same quantity of free chlorine in the contents of the cart." ("Official History of the War," Medical Services, Hygiene of the War, Vol. I, p. 75).

A War Office Economy Committee in charge of Sir Napier Burnett was established. This Committee worked in collaboration with Colonel Sir William Horrocks and Lieutenant-Colonel E. V. Cathcart and was thus able to judge of the various articles of food in which it was desirable to exercise economy. It was Sir William Horrocks, too, who advised the Army Council to put Professor H. Brigg's method for testing fitness into full use by setting up in Edinburgh University the Military Physical Test Station. Colonel Horrocks and Lieutenant-Colonel G. S. Buchanan with Dr. Mervyn Gordon, after visiting the Canadian Camps which had suffered most from cerebrospinal fever, recommended the attachment of Colonel R. J. Reece for service with the Army Medical Directorate, in connexion with the disease; a duty which led to his drawing up, under the direction of Colonel Horrocks, a scheme for the control of cerebrospinal fever, which was at once put into operation.

But it was as Chairman of the Anti-Gas Committee that Horrocks played, perhaps, his principal role. The Anti-Gas Department, which was to control both the design and commercial production of respirators and other defensive equipment, was under his direction and, in this duty, he was assisted by a small Anti-Gas Committee composed of officers of the Medical Services, an officer representing the Ordnance Department, and civilians with expert knowledge of chemistry, physiology and pharmacology. This body, through Colonel Horrocks, kept in close touch with an organization of laboratory workers and chemical advisers detailed for the same duties in France. It was thus instrumental in producing the protective devices, gas helmets and, finally, box respirators so justly famous in the Great War. The fact that the Anti-Gas Department was able to meet all the demands made upon it must largely be attributed to the fact that research, design,



manufacture and inspection were all finally controlled by one Department : one is tempted to say "by one man"! The scale on which protective devices were manufactured during the War may be grasped from the fact that the total number of official respirators manufactured in England and supplied to the troops was fifty-five millions!

In 1919 he became the first Director of Hygiene at the War Office, an appointment which early recognized the importance of the subject, and a fitting tribute to one who had done so much to establish Military Hygiene on sound lines.

His War distinctions included : 1914-1918, France ; Despatches, twice ; *K.C.M.G.*, *C.B.* ; 1914 Star and Clasp ; British War and Victory Medals.

In the present war, though he suffered much anxiety for his son who was commanding the 2nd Middlesex Regiment up to the evacuation of Dunkirk, he continued to make the Journal his main occupation. His daughter writes, "He took this war in his stride and was quite unmoved through one really bad raid here."

Major-General Marrian Perry, *C.B.*, the Director of Pathology, an old and intimate friend, writes the following note which makes an appropriate end to this obituary notice :—

"The death of Sir William Horrocks has deprived our Journal of an Editor whom it will be difficult to replace adequately. For thirty-two years he has shouldered the burden of its production and has contributed Editorials on subjects of current scientific interest which were characteristically always instructive and lucid. The task was not an easy one. There were many lean months when the scarcity of articles taxed his ingenuity to fill the pages of the next issue. But somehow he overcame all difficulties and the monthly number never failed to appear.

"His contributors did not all possess a finished literary style. When they came to read their published articles some must have marvelled at their clarity of expression and grammatical exactitude. Sir William had disentangled many involved sentences and re-arranged misplaced paragraphs with his facile pen.

"The writer has been privileged to see him constantly during the last ten years. It was evident that one of his greatest interests was his beloved Journal. Whatever time of the day he was visited he would be found correcting articles, reading the proofs of his next issue or writing one of his Editorials which he prepared with meticulous care.

"A week before his death, when he was confined to his bedroom, he was still anxious to know what useful subject he could comment on at this period when so much remained to be done and so little time was left to him to do it. There was no weakening of the intellect, no relaxation of intense interest in current events which might be legitimately expected in one who had reached his four score years. Those of his contemporaries who remain will miss him and those of a younger generation who had the good fortune to know him will lament his passing."

---

Authors are alone responsible for the statements  
made and the opinions expressed in their papers.

---

**Journal**  
of the  
**Royal Army Medical Corps.**

---

**Original Communications.**

---

AN A.D.M.S.'s EXPERIENCES WITH THE B.E.F.—MAY, 1940.

BY COLONEL C. M. FINNY.

VERY URGENT.

"X" Corps.

26th May, 1940.

"It is considered of the greatest importance that a certain number of officers and N.C.O.s who have had the invaluable experience of the operations during the last fortnight should be sent home forthwith to impart their knowledge to reinforcing divisions still in the U.K.

Selected officers and other ranks must be sent by to-night, if possible, to report to Corps H.Q., 'A,' with a note quoting this letter, when arrangements will be made for their onward despatch.

(Sgd.) ——— Brigadier.

D.A. & Q.M.G., 'X' Corps."

When I received this order, the Division to which I had the honour of being A.D.M.S. was holding its sector of the line east of Lille, and had no intention of being dislodged. The sun was shining, casualties were few, and we were settling down into our new position.

I took the above order at its face value. Quite a lot had been learnt, and it seemed a good idea to pass it on without delay.

In the light of subsequent events it now appears that the object of the order was to ensure that at least some of the B.E.F. escaped before the "jaws of the pincers" completely closed between it and the sea.

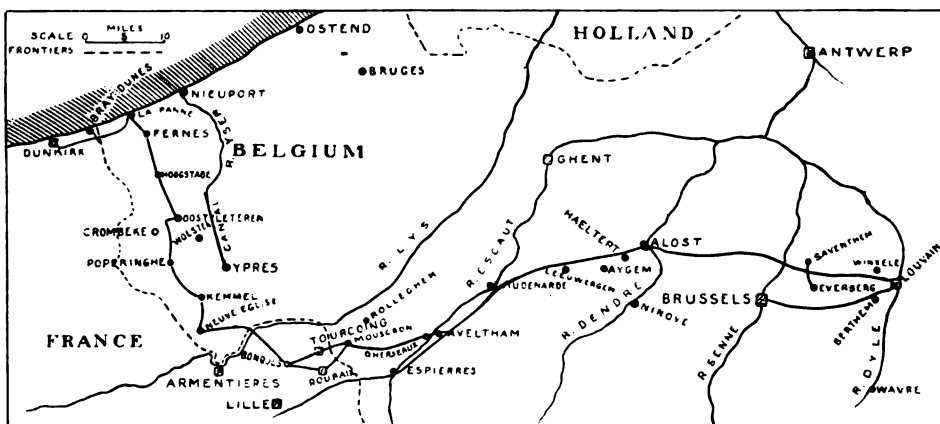
As one of those who "had the invaluable experience," and who also had time to keep a diary, I feel that some account of such may be of interest,

and possibly of help, to those who were not there. I say "possibly" because I quite realized that the operations were mainly of a special kind—retirements in the face of the enemy—and I hope that these may never need to be repeated.

At the same time, little has been written about this type of warfare, so that our efforts to deal with the situation may at least provide interest.

I propose to give an account of the more important events and arrangements by extracts from the diary, and to add comments at the end. Names of places are mentioned freely, as the events are past history. "Security" will not be disturbed.

I must apologize in advance for the free use of the first person singular, but it is difficult to eliminate it in a diary which was written largely as a private letter.



But first some account of the preliminary arrangements is indicated.

From the disposition of the German forces it was obvious that they might either attack France by obtaining permission to pass through Belgium, or invade Belgium first. In the latter eventuality, if help from the Allies was called for, we were to move rapidly into the country with the intention of stemming the German advance.

The sector of the front allotted to the B.E.F. lay along the River Dyle from Wavre to just north of Louvain. The details of this were known as "Plan D."

The Division I was with was to advance at once to occupy the river line. The other Divisions in the Corps were to start later and occupy positions in support. The method consisted in a very rapid advance of mobile troops (consisting of the Divisional cavalry regiment supported by detachments of R.H.A.). This was to be followed by the Forward Body (Anti-tank

Regiment, R.A., and Machine Gun battalion, with small advance parties of other units). Then came the "Z" Infantry Brigade, followed by "X" Brigade next day; while the "Y" Infantry Brigade was to follow in two days' time.

As a precautionary measure, the units comprising the mobile troops and forward body took up their positions early in May, close to the Franco-Belgian frontier, so as to be in a position to cross it without delay.

The medical arrangements made to deal with the move were as follows:—

Each field ambulance was to accompany its corresponding Brigade, but as "Y" Field Ambulance was not to move for several days, it provided one company to proceed with the Forward Body and open an A.D.S. at Leeuwergem to deal with casualties *en route*. This company was to rejoin the remainder of its unit as the latter moved forward, by which time a C.C.S. was detailed to open at Haeltert. To ensure the company being able to move quickly it was located in the same village as the troops of the Forward Body and placed under orders of its commander.

The medical arrangements for the Cavalry Regiment required special attention, as it might suffer casualties while far ahead of the rest of the force. To deal with this three motor ambulances were attached to the unit under control of the M.O. In addition, a "Light Section" was formed from "Z" Field Ambulance, and placed ready loaded in the same location as the Cavalry Regiment. Its composition was approximately that of a light section of a Cavalry Field Ambulance, and included two motor ambulances and one M.O.

The latter had orders not to proceed beyond the River Dyle, but to keep in touch with the cavalry and open an A.D.S. if required. On the arrival of the remainder of his unit he was to be absorbed into one of its A.D.S.s.

To deal with casualties occurring during the advance from air attack, one or more motor ambulances were attached to each column. The Division was to advance along two main roads, and as the motor ambulances of the field ambulances were insufficient for this purpose, arrangements were made with the D.D.M.S. of the Corps for one section (twenty-five vehicles) of a M.A.C. to be placed under my orders during the forward move. In addition, arrangements were made for one car from each field ambulance, containing a small reconnoitring party, to accompany the Forward Body. Their function was to find suitable accommodation for their units, and sites for dressing stations, before their arrival; a most necessary step.

May 10: News received that Germany had invaded Belgium.

The Divisional Commander called a conference at 11.00 hours. At it he informed us that the King of the Belgians had invoked the Allies' aid, and that Plan D would be put into operation forthwith.

As time was short, I called a conference of Field Ambulance Commanders at 14.00 hours, and explained that the original Plan D was being put into operation.

One difficulty arose—the transport of the R.A.M.C. personnel for whom

no vehicles are provided. It was obviously impossible to indulge in "ferrying" when the move was over seventy miles. Attempts had previously been made to have provision made for carrying these men—at least two 3-ton lorries per unit were asked for. "Q" was sympathetic, but could not produce them. They were not to be had.

Fortunately, however, several of the lorries issued to the field ambulances were considerably larger than those officially authorized, and owing to men being on leave, the numbers were not up to strength. These factors combined with the dumping of a certain amount of non-essential equipment provided travelling accommodation for nearly all the men. The few left over went as extra nursing orderlies in M.A.C. motor ambulances.

The Cavalry crossed the frontier at 14.00 hours, followed shortly by mobile troops, Command Group of Divisional H.Q., and Forward Body.

The "Operations Group," which included the A.D.M.S., left at 21.00 hours, and travelled undisturbed through the night, arriving at Everberg (eight miles East of Brussels) at 07.00 hours.

Passing through Alost we saw the first of the German bombers' handiwork. The place was strewn with broken glass and several houses were completely demolished. In one of them the Corps A.Q.M.G. perished—probably the first casualty we sustained.

May 11: Provisional sites for M.D.S. and A.D.S.s had been fixed in advance. Being in advance of my field ambulances, I reconnoitred them for suitable buildings, but found that the officer sent with the advance party of "Z" Field Ambulance had in most cases already found adequate accommodation. This was the only medical unit due to arrive that day, and so it had to provide the M.D.S. and both A.D.S.s. These were sited at Saventhem (M.D.S.), Winxele and Berthem (A.D.S.s):

At 15.00 hours news came that the Divisional Cavalry Regiment, which had advanced east of Louvain, had been bombed and sustained some severe casualties—one report said 40. As our C.C.S. had been left over 100 miles behind, I visited "Z" Field Ambulance to inform the C.O. that he must be prepared to receive and possibly operate upon and retain a number of severe cases.

Having fixed up for additional motor ambulances—three had been attached to the cavalry for the move—I visited the unit and found, as so often happens, that things were not as bad as had been represented. The "40" was really "4," and none of them were very serious. This was a relief for "Z" Field Ambulance. They were tired after the long night journey and had no surgeon of experience available.

May 12: "X" Field Ambulance arrived, and was ordered to take over the A.D.S. at Winxele. The remainder of the unit was kept closed in Saventhem.

The position occupied by the Division consists of the River Dyle from a point about three miles south of Louvain to a point two miles north of the town—which entails "X" and "Z" Infantry Brigades being in the line, with "Y" Brigade in reserve.

The bridges over the river on the East side of Louvain seem to be a very popular target for German bombers. They have hit them several times. One bomb killed a sapper officer, but the bridges are still intact. The houses near by are the reverse, one street in particular has been almost completely demolished.

Divisional H.Q. moved to-day from the Chateau of Everberg to the small village of Zavel nearby.

It is interesting to observe the number of Belgian soldiers walking or bicycling along the main roads in a Westerly direction.

May 13 : The enemy have not yet made contact. I was able to visit the cavalry in front of Louvain without any difficulty beyond the dodging of dislocated trolley wires in the streets. Refugees are beginning to stream west in large numbers, accompanied by their compatriots in uniform, who pause frequently for food and drink, or, if they possess vehicles, to cover them with the leafy boughs of trees.

May 14 : Last night the enemy began to attack. The cavalry withdrew and the bridges were blown up. The country seems to be a mass of spies. Among other activities they indicate the position of Brigade or Battalion H.Q.s by whitewashing their houses in a special way, or by ploughing arrows in the ground, not easily seen on the ground, but obvious from the air—with annoying consequences for the H.Q. As a result all civilians have been ordered out of the divisional area. Most seem to be going spontaneously, but it presents difficulties in the case of the sick and infirm. This problem is acute in the building at Berthem occupied by the A.D.S. It is a convent with a hospice for the aged attached. I gave permission for some of a field ambulance transport to be used for the purpose, but had to cancel it soon after. I was visiting the H.Q. of an Infantry Brigade close by, when a message came in to say that the enemy had broken through and were advancing along the main road towards Berthem. It turned out to be untrue, but I could not risk the chance of the A.D.S. being left without its transport at a time when a quick get-away might be called for.

May 15 : Fighting is getting fiercer. Small parties of the enemy have made several crossings of the river, but have invariably been driven back. Apart from one long range gun which shelled the Chateau at Everberg, they have not yet brought up much artillery, so that Louvain is a fairly safe place, and several R.A.P.s are functioning there. They are evacuated by motor ambulances, one of which is attached to each.

The area now seems to be almost empty of civilians, but full of animals wandering about miserably—particularly the milch cows. The soldiers relieve them as much as they can.

H.Q. moved again—into another chateau further south. Zavel was carefully bombed shortly after, but too late to do us the harm intended.

May 16 : A.D.S.s are now working well, and arranging for work in cellars, as some bombs have fallen fairly close.

Louvain presents a strange sight : a large modern city with not a soul

to be seen except parties of soldiers, and they are too busy fighting to wander about.

"Y" Brigade is now in position on a support line about six miles behind the front, and "Y" Field Ambulance has opened an A.D.S. in this area in case of need. The remainder of "Y" and "X" Field Ambulances (less one company) are being held in reserve.

After lunch I set out to visit the D.D.M.S. of the Corps, who had moved up to a location in the northern suburbs of Brussels. I had reached the locality and was casting about for his office when I was recalled from my search to attend a Divisional H.Q. conference.

Since leaving France we have been in a peculiar situation for modern times—a complete lack of news. No English newspapers have reached us and, owing to the fact that the wave-length of the Brussels broadcasting station is almost the same as the B.B.C., wireless news on portable sets has been impossible. It was, therefore, an unpleasant surprise for most of us to learn at the conference that the troops on our right had been driven back, and that we have to execute a "retirement in conformity" to-night.

The General explained that it is not likely to be easy to break away from an attacking enemy, but he has arranged for concentrated gun fire from all Field Regiments this evening on both advanced and rear enemy positions. We are to retire west of Brussels, through the Division, which is to hold the line of the River Senne until midnight.

I visited the O.C.s all three field ambulances, who were all in the Saventhem area, explained the position and gave instructions for the hour of withdrawal of A.D.S.s and the locations to which the units are to proceed. The main bodies of the field ambulances were ordered to move as soon as possible, so as to leave the roads as clear as possible for the fighting troops.

Divisional H.Q. moved off at 21.00 hours. Before leaving I had an excellent view of three German bombers supported by fighters. They were circling round at about 500 feet apparently looking for choice targets—an unpleasant sight when one realized that the roads were already congested with traffic. Presently the smoke from bursting bombs was visible not far off, and the noise of others could be heard. Actually, little harm was done, even though they also machine-gunned several units, including "Y" Field Ambulance just as it moved off.

May 17: The drive through the outskirts of Brussels in the dark without lights might have been very difficult, but turned out otherwise. The Provost Company had been provided with a large number of "fairy lights." These are small metal boxes containing a yellow glass front, with a weak bulb and a dry battery. Though invisible from the air they can be seen from the ground at a distance of nearly 100 yards. These were distributed along the edge of the road at junctions and showed the route very effectively.

H.Q. arrived in Kirkxham at 07.30 hours but, as it proved unsuitable, moved later in the day to Aygem. Thanks largely to the good shooting

of our guns the enemy made no effort to follow up when the forward positions were evacuated, and the withdrawal was effected with only trifling casualties.

I took the opportunity of being so close to visit No. 6 C.C.S., which had been pushed forward to Haeltert, and has been doing very good work. They were packing up and moving back by rail. This means that our nearest available C.C.S. is now in the Lille area.

"Y" Field Ambulance has been ordered to open a M.D.S. in Aygem, but the other field ambulances are being rested until it is seen if A.D.S.s are necessary. At present the front is not far distant, and casualties are being sent direct from R.A.P.s to M.D.S. in motor ambulances.

May 18 : The Division is now holding a line on the River Dendre between Ninove and Alost, and the enemy has not yet made contact again.

This morning O.C. M.A.C. visited me and suggested that the section of his unit attached to this Division should rejoin its H.Q. This I strongly opposed, as a further retirement is in the air.

He agreed.

Commanders conference at 17.30 hours.

G.O.C. explained that owing to the situation on our right a further retirement to the River Escaut of the Division would take place after dark. Owing to the fact that the enemy has only just established contact, he was of the opinion that it would be a much easier manœuvre than the previous disengagement.

I warned O.C.s Field Ambulances to be prepared to move at short notice, and to send on advance parties to find suitable buildings in the areas provisionally selected for M. and A.D.S.s.

Later, information was received that owing to exhaustion of some of the formations on our right, the retirement is postponed for twenty-four hours. This gives more time for tidying up the move and working out march tables. At the same time it will mean another disengagement from an attacking enemy who may not be shaken off so easily this time. I sent an urgent request to O.C. M.A.C. for a further twenty-five motor ambulances.

At a second conference held at 21.00 hours G.O.C. explained that owing to rapidly increasing enemy pressure on our front it may be impossible to break off the engagement to-morrow night, and that it will have to take place at 10.00 hours to-morrow. He detailed his method for reducing the dangers of such a manœuvre in daylight, and informed us that we would now occupy a different sector on the Escaut front from that originally allotted. Non-fighting units are to retire forthwith. Conference ended 23.00 hours.

I sent orders to "X" and "Z" Field Ambulances to get under way at once, giving them new locations. "Y" is to continue to function till 05.30 hours. Casualties are less frequent during the night, and any occurring after then will have to be brought back to the new position. I then visited the M.D.S. They had taken in eighty casualties since 16.00 hours, including a good many serious ones. Most of them had been sent down to the C.C.S., but none of the motor ambulances had returned, nor had the extra twenty-



five which I had asked for. (I learned later that the roads were so congested with refugees as well as military traffic that it was impossible to move against the stream.)

Motor ambulances have been distributed fairly freely to all the larger units, so I told the C.O. to post an officer at the cross-roads near Aygem with orders to extract all empty ambulance vehicles from the passing columns. Wounded must not be left behind if we can avoid it.

May 19 (Sunday): "Ops. Group" of Divisional H.Q. moved off at 03.00 hours. There was a stretch of about two miles to go before striking the main road. In the dark the leading vehicle of the column took a wrong turning and before long found itself in a cul de sac. Other vehicles began to pile up behind and a serious jam was threatened. Fortunately, there was just room in front to turn one by one and retrace our steps, and the danger of exposing an immobilized column of vehicles to the attentions of enemy bombers at dawn was averted in time.

Once on the main road movement was all right. I left the column at Avelthem, just outside our new Divisional Area and joined our "A.Q." at a Report Centre there. Units from all sorts of divisions passed or stopped for information. There was some inevitable confusion owing to the fact that advance parties had been despatched on receipt of the original order and they did not know that the location of Divisions had been subsequently altered. I found several field ambulances from an adjacent Division in our area. But these matters are easily adjusted, and before dark the troops were all west of the River Escaut.

While waiting at Amelghem I was told by a padre that a unit had suffered a large number of air-raid casualties which were being brought along in lorries. I collected a number of motor ambulances from passing columns, and told the policeman on point duty to stop all vehicles of the unit concerned and inquire if there were any wounded on board. There were surprisingly few to deal with, despite the fact that there had been a fair amount of bombing.

The small amount of damage done by air attacks upon columns on the move is one of the pleasanter surprises of the war.

May 20: The Division has taken up its position on the River Escaut between Espierres and Avelthem. H.Q. at Mouscron. The forward position is overlooked by two low hills on the enemy's side of the river, which is encouraging for their snipers. Actually, when the sun is shining low in the west, the risk from them is slight, and movement by car as far as R.A.P.s is easy. A M.D.S. has been opened by "Y" Field Ambulance at Herseaux, with an A.D.S. further south. The left flank is served by an A.D.S. from "X" Field Ambulance. The remainder of "X" and "Z" Field Ambulances have been located unopened at Rollegem in the north of Divisional area. They are safe from shell-fire there, and can be easily moved should another retirement be ordered.

At a conference to-day, the G.O.C. said that our line was to be held at all cost—except for reasons outside Divisional control.

Later we heard the unpleasant news that the enemy have entered Amiens and Arras, and that our line of communication is severed. A further retirement seems probable.

May 22 : Conference 10.00 hours. General explained that we are to retire again, but not far this time, only to the positions on the Franco-Belgian frontier, which the B.E.F. spent most of the winter improving. Unfortunately, we are not going to our own area, in which some 200 pill boxes have been recently erected, but to a portion of the frontier further north—in front of Tourcoing and Roubaix. Our forward defence lines are to be evacuated at 03.00 hours to-morrow.

The news to-day reported the recapture of Arras. Whether this is permanent or only temporary it is a refreshing change.

The Division as a whole is not to start moving till after dark, but I was able to get the field ambulances in the back area away much earlier. "Z" Field Ambulance was ordered to proceed forthwith to a large convent school near Bondues, and open a M.D.S. by 17.00 hours to-day. I knew the school ; an excellent place for a M.D.S.—as long as it is not bombed.

O.C. "X" and "Y" Field Ambulances were ordered to send on reconnaissance parties and open A.D.S.s in Tourcoing and Roubaix respectively. The remainder of these units are to find billets in the rear of the new Divisional Area. Divisional H.Q. moved to Bondues in the evening. Our brief visit to Belgium was over—for a time.

May 23 : 10.00 hours. Visited a field ambulance, as its C.O. had been unable to locate a C.C.S. and seemed in need of surgical advice if his casualties had to be retained.

I was glad that he was able to open the previous evening, as casualties began to arrive at 18.30 hours, mostly from two other Divisions. There were about eighty cases in when I arrived, but as I had just heard of the location of a C.C.S. we were able to get them away. The handling of C.C.S.s in this type of warfare must be very difficult. They cannot open and close in a twinkling—nor have they their own transport.

The Division is now holding a line to the east of Tourcoing and Roubaix ; not a good position, as houses interfere with a clear field of fire. Also, the local inhabitants get in the way, not to mention refugees. These have been streaming west since we first entered Belgium. Now large parties may be seen moving east into these two large towns. Most of the civil administration of Roubaix and Tourcoing have fled, and our "A.Q." is trying to organize the remnants. Efforts are being made to remove civilians from the region of the firing line. At one point there is a large "Hospice" filled with some hundreds of decrepit old people. We have been using such motor ambulances as can be spared to move them to a safer part of the city.

May 24 : Things fairly quiet in our area, though my D.A.D.M.S., who spent the afternoon hunting for C.C.S.s and Advanced Depots of Medical Stores, seems to have come in for a lot of bombing.

Later, news came in that the enemy had penetrated the Belgian line on our left on a 3,000 yards front. A counter-attack is to be made at dawn.

May 25 : Yesterday " Y " Brigade undertook a reconnaissance in force in its sector of the line and found a lot of Germans. Five officers and seventy-seven other ranks were treated in one A.D.S. during the night. One casualty was bleeding severely from a head wound. It could only be controlled by digital compression of the common carotid. This an orderly continued to apply all the way back to the M.D.S.—a fine bit of first aid.

Advantage has been taken of a lull in our movements to get the men a bath. The Mobile Bath Unit started to function in Bondues, and also sent forward sets of sprays in Roubaix and Tourcoing, near enough to the firing line for the men to walk and have a bath when opportunity offers.

At dinner we heard that the German thrust against the Belgians has been successful and they are falling back. The Division on our left has been swung back on to the River Lys facing almost north.

The enemy are also reported to have reached Carvin about 15 miles south of Lille. As Boulogne has also gone we are cut off from our General Hospitals, and the evacuation of casualties is going to be a problem.

Quite apart from the medical problem, things do not look too good for the B.E.F. We seem to stand a good chance of being surrounded, unless the long-expected attack by the French army from the south materializes.

May 26 (Sunday) : It was on this day I received the order which I have quoted at the beginning of this account ; a peaceful day on the whole, but at 17.00 hours I was summoned to attend an urgent conference. The Divisional Commander explained that the Belgian front on our left was crumbling, and the Division had been thrown in to stop the gaps. The big French push from the south had not materialized, and, therefore, to avoid complete envelopment, orders had been received to withdraw towards the coast near Dunkirk, where the troops are to embark, but all vehicles and equipment will have to be left behind.

The forward defence lines are to be evacuated at 06.00 hours to-morrow ; others to go earlier. " Ops. Group " Divisional H.Q. to start at 20.00 hours to-night. I arranged with the Commanders of the " X " and " Y " Brigades to give the A.D.S.s orders as to when they are to move, and sent orders to Os.C. all Field Ambulances to be prepared to march at short notice—march tables had not yet been made out, and the road accommodation is limited.

O.C. " Z " Field Ambulance was ordered to open an A.D.S. in Neuve Eglise by 06.00 hours to-morrow, and " X " Field Ambulance one in Poperinghe where a stand may have to be made.

Later I was told that the field ambulances could start at 20.30 hours, so I sent a message to " Z " Field Ambulance and went personally to inform the other field ambulances, whom I had to move earlier in the day to the area N.E. of Lille.

May 27 : Divisional H.Q. did not finally start till 01.30 hours ; which was as well for me, as I spent the earlier part of the night fixing up two D.R.s who had met head on in the dark. One had a dislocated shoulder and other injuries, and the other a fractured femur. Fortunately we had

a Thomas' splint in the office, and the dislocation went back without requiring an anæsthetic. The journey was slow as usual, but without incident.

The Germans, as a rule, like to ease off at night, but on this occasion gunfire could be heard on three sides, while ahead was the smoke of a burning building.

At 05.30 hours we reached Neuve Eglise, where I left the column to visit the A.D.S. It was a good place to stop at, as forward movement was almost impossible. In addition to one column going north, there were Belgian troops moving west and French going east. The result would have rejoiced the heart of a German bomber if he had been overhead.

One had evidently been busy on a previous occasion, as some streets were badly messed up. Burnt-out cars and dead horses added to the scene of destruction.

I found "B" Company of "Z" Field Ambulance settling in, and explained what I wanted of them: to advertise their presence to passing columns and to take care not to be left behind—and went on to Poperhinghe. The traffic jam had sorted itself out by then.

The Company of "X" Field Ambulance which was to form the A.D.S. there had not arrived, so I went on to the Divisional Report Centre at Hoogstade, where "Z" Field Ambulance had arrived, and was opening a M.D.S. They are getting very good at it. This war of movement is wonderful training.

When getting into the area I noticed a large number of vehicles blazing by the roadside. At first I thought it was the result of the German bombs, but soon discovered that the injuries were "self-inflicted." Some over-zealous A.P.M. had taken the instruction that nothing of value was to fall into enemy hands very literally, and given orders that all vehicles on arrival in the area were to be abandoned and destroyed forthwith. Apart from the stench of burning rubber it was a most demoralizing sight. That the execution of the instruction (to destroy all vehicles) was premature was shown in the evening, when orders came to the effect that we are to stand and fight in our new position—possibly for a week or more. After the sight of those burning and jettisoned lorries this was good news.

May 28: Now the Division and some French troops are on our left, and another Division is moving up there. Our Division is holding the line of the Yser Canal north of Ypres facing east. I put one A.D.S. at Oostvleteren and one at Woesten (both from "Y" Field Ambulance). H.Q. "Y" Field Ambulance and "X" Field Ambulance are in the north of the Divisional area a few miles south of Furnes.

I visited a C.C.S. at Crombeke. It is doing splendid work in spite of having been bombed. It has been established some days, so that its position is well known, and casualties keep on streaming in from every direction. Most of them are housed in a church, but the C.O. has to keep on taking in fresh buildings and there appears to be a hitch in getting them away. He seemed cheerful and unperturbed, and everyone, including the sisters,

seemed to be working away without a thought for anything but the job in hand.

The bombing of this unit appears to have been accidental. The C.O. told me that after it he hoisted a Red Cross flag, and that since then he had not been molested.

Knowing that our stay in that area was only to be brief, I was surprised that the C.C.S. had not received any orders to move, but later I learned that it was being ordered to remain in position and to be allowed to fall into German hands.

That night Divisional H.Q. lodged in a monastery. The genial monks offered to look after any kit that officers had to leave behind. At an evening conference we learned that our next move is to take place to-morrow. forward defence lines to be evacuated at 21.00 hours.

May 29 : News has come in that our G.S.O. 1 was killed last night—apparently shot accidentally while investigating the cause of a traffic jam. It is a serious loss at a time like this.

Our new position is to protect the southern sector of the Dunkirk "bridge head," along the canal which runs east and west through Furnes from a point south of La Panne, to just east of Furnes. The Division and some French troops are to occupy the gap between our left flank and the sea near Nieuport.

I ordered "X" and "Y" Field Ambulances to find sites for M.D.S.s in La Panne. The M. and A.D.S.s are to remain in position till 21.00 hours. but I arranged that, should there be any subsequent change in the situation, they would get orders from the nearest Brigade H.Q. To ensure that they should not be forgotten, I instructed the Os.C. Companies concerned to attach a runner to the H.Q. who is to bring them the latest news.

An order has been issued that no vehicles are to be allowed inside the bridge head : they are to be put out of action and left south of the bridge at Furnes. In case the police were under the impression that this order applied to medical units, I wrote out passes to permit motor ambulances and essential medical equipment to cross the bridge and got the General to sign them. Non-essential vehicles and equipment will of course be jettisoned.

I then paid another visit to — C.C.S. as I had been told that the Nursing Sisters were proposing to remain behind with the unit, and so was the O.C. Advance Depot Medical Stores which is also in Crombeke.

I found that the Sisters had changed their minds since yesterday, and consented to leave this morning. I persuaded O.C. Advance Depot Medical Stores to follow their example. His stores can only be used by — C.C.S., and can be handled by their Q.M. A regular R.A.M.C. Q.M. is not to be wasted. In addition to taking him, I loaded my car with a supply of morphia, "693" and other drugs and dressings which might be useful at La Panne, and started off for our new H.Q.

On the way I stopped at "Z" Field Ambulance and presented the

C.O. with my "looted" Q.M.—he has not had one all this time, as his own was on leave on May 10. The M.D.S. was working briskly in a church, and at the same time setting a fine example of steadiness and discipline under trying conditions.

I then moved north to find Divisional H.Q. It was located in a group of sand dunes about two miles south of La Panne.

The only building consisted of a wooden bungalow, which was taken over for "A" Mess, and the General's sleeping quarters. Apart from that lorries and vans were used for offices and the ground for sleep.

I then went on to visit the field ambulances at La Panne. It was a beautiful afternoon with the sea shining blue in the sun. But the atmosphere of a seaside resort in summer was marred by German bombers.

As I stepped from my car at the bandstand I was greeted by the unpleasant whine of falling bombs, while the beach was alive with spluttering incendiaries. They seemed to be chiefly of this type, as the couple that fell near by did little damage. A few civilians were hit, but only in the legs, and stretcher parties were immediately available from "Y" Field Ambulance which had opened a M.D.S. in a hotel close by.

The bombs were apparently being aimed at the vessels off shore, and in the absence of our fighters the bombers were flying low, and making the most of their opportunity, apparently undeterred by the vigorous A.A. fire which was going on. Most of the bombs fell in the sea or on the beach, but two vessels were set on fire. This was put out in the destroyer, but it had taken too firm a hold on the smaller vessel, which apparently was burnt out.

Little damage was done in the town. Only one house was burnt; which was lucky, as for some reason the water supply had been cut off from the houses.

May 30: The night was cold sleeping in the open, so I set my clerks to dig a trench for my D.A.D.M.S. and myself to sleep in to-night. I then visited La Panne.

"Z" Field Ambulance had arrived and is located (closed) in a hotel. They stayed at Hoogstade till 21.00 hours last night, and came in for a good deal of shelling both when in position, and while retiring along the road to Furnes. Miraculously, none of them were hit, and they got all their casualties away.

"X" Field Ambulance has opened a M.D.S. close to "Y" and both are expanding. Between them they have taken in about 400 casualties. The attack last night on the "Y" Brigade was peculiarly fierce, and for the first time our troops were forced to retire earlier than planned. They left the forward defence lines at 18.00 hours, and suffered a good deal of shelling. I was glad that I had made the retirement of the A.D.S.s dependent on orders from the Brigade Commanders.

The M.D.S.s present a serious problem. Easy to fill them but hard to empty. It is rumoured that hospital ships have been so fiercely bombed that they are unable to embark casualties, and anyhow the only available

port for them is Dunkirk, which is twelve miles distant, and the road to it is blocked by masses of abandoned French vehicles.

I made several attempts to find someone in authority from whom to get orders, but it was difficult. I located the office of Lieutenant-Colonel — R.A.M.C., who is A.D.M.S. of the Area and has been working hard to get casualties away, but failed to find him or his D.A.D.M.S. at home. I met Major —, R.A.M.C., of G.H.Q. Staff. He is working on embarkation at Dunkirk, and he told me that despite several having been sunk the hospital ships have been evacuating wounded daily. As their number is limited they are being kept for stretcher cases, and "walking wounded" have to go in other craft.

The sea front at La Panne is a sort of military Harley Street. Nearly everyone seems to be in the R.A.M.C. In addition to my three field ambulances, Nos. —, —, and — C.C.S. and — Field Ambulance are located in hotels by the sea. No. — C.C.S. is at Rosendael near Dunkirk and, I understand, is holding casualties prior to embarkation.

At a conference after lunch our G.O.C. informed us that our present position (which runs east and west through Furnes) must be held to the last man.

As our area is now much restricted I did not consider it necessary to open formal A.D.S.s. There are plenty of motor ambulances available. Some of these have been distributed to units, and so can convey casualties almost as quickly to the M.D.S. as to A.D.S.s a few miles inland.

I sited car posts nearer the firing line, and ordered a reserve of cars to be always ready for immediate despatch from La Panne.

It was dull and overcast most of the day and few bombers were on the move. There was some wild shelling in the evening.

Conference at 22.30 hours. Despite the fact that our line is considerably shorter than heretofore our numbers are also reduced. Only one battalion is available for Divisional reserve, and the line is being held in places by Field Companies R.E. and R.A. units, who have had to dispose of their guns, armed with rifles. The weight of attack is also increasing, and so is the number of enemy guns. It has, therefore, been decided that — Corps must embark by to-morrow night. The forward defence lines are to be evacuated at 01.30 hours and the troops moved to the beaches covered by carrier platoons. The other Division in this Corps is to embark in the La Panne area and our Division at Bray Dunes, some four miles further west. La Panne is to be evacuated by 04.00 hours. Any troops still on shore by then are to proceed to Dunkirk. A defensive line on the Franco-Belgian frontier (just east of Bray Dunes) is to be held by — Corps.

These are the orders for the fighting troops, but to allow the maximum number of boats to be available for them, all troops who can be spared are to proceed to Dunkirk earlier in the day. Ops. Group of Divisional H.Q. is to report at La Panne at 21.00 hours.

Conference was not ended till midnight, so I sent a message to O.C. "Z"

Field Ambulance ordering him to march his unit to Dunkirk in the early morning, and retired to my trench. It proved very useful, as it not only kept off the cool north wind, but gave a pleasant sense of security when our sand dunes were shelled during the night.

May 31 : Casualties kept trickling into the M.D.S.s all yesterday, and with nowhere to evacuate them to I expected to find both overflowing this morning. I visited them early with written orders in my pocket to the effect that at least a proportion of the unit would have to remain behind to look after their patients when they fell into German hands ; a terrible order to give to anyone. It was, therefore, a great relief to find that yesterday evening a road had been forced through the jettisoned vehicles which had isolated La Panne from Dunkirk, motor ambulances had been collected from the latter town and the majority of wounded had been evacuated. " X " Field Ambulance had been cleared, and few remained in " Y "

I then made another effort to find Lieutenant-Colonel —, R.A.M.C., and found him in his office. He had organized a combined M.A.C. to ply between La Panne and Dunkirk, and had been largely responsible for getting so many casualties away during the night. Two hospital ships had come in and been loaded up.

An informal conference took place between O.C.s — Field Ambulance, — C.C.S., and myself. It was agreed that instead of medical personnel from six different units remaining behind to look after six small parties of wounded, all medical units should send such casualties as remained into a combined M.D.S. by 14.00 hours.

A rear party consisting of one M.O. and ten O.R.s is to be sent from each unit to man it until 04.00 hours on June 1 (the hour at which La Panne is to be evacuated by fighting troops). Any wounded which cannot be removed by then will have to fall into enemy hands, and a sufficient number of R.A.M.C. will have to remain to look after them, at the rate of one M.O. and ten O.R.s per 100 patients. The actual individuals to remain are to be decided by the drawing of lots. The site chosen for the combined M.D.S. was the Casino with the adjacent cinema, at present occupied by — C.C.S. The combined M.A.C. is being parked in the road behind.

I then returned to my field ambulances. " Z " had already left, but I gave orders for the transference of such patients as remained in " X " and " Y " to the Casino, and for the rear parties to be detailed—by drawing lots if preferred, except that the C.O.s were forbidden to remain. They were ordered as soon as this was completed to send all available motor ambulances and drivers to join the M.A.C. behind the Casino, and to march to Dunkirk. A sufficiency of motor ambulances were left with each fighting unit, and at the car posts. There is no dearth of motor ambulances inside the perimeter, but drivers have proved a difficulty in some cases. The field ambulance drivers have been doing excellent, conscientious work, frequently under fire, but I have been informed that over 100 motor ambulances were recently left near Dunkirk, and their drivers were not to be found.



C.R.A.S.C. has undertaken to send 25 drivers from one of his units to help retrieve and drive these motor ambulances.

I visited the combined M.D.S. at 19.00 hours. Work was going on briskly, but plenty of motor ambulances seemed to be available to prevent the place filling up, and the O.C., Major ———, of — C.C.S., was clear about the orders for final evacuation, and seemed to have the situation well in hand.

I had just left the place when the enemy started some shelling with timed H.E. The German gunner seems to be a methodical individual. He likes to fire five rounds at an interval of about ten seconds. Then there is a pause of a few minutes, followed by another five. After a few of these groups he often takes a rest. Between each group there is time to find fresh cover if you do not like the spot chosen on hearing the approach of the first shell. On this occasion the shells did little damage, as they went over the houses and burst on the sands which were unoccupied. A few shell fragments went through my car, which was on the sea front, but as neither my driver nor myself were in it, there was no harm done. This shelling, though harmless at the time, was evidently intended to get the range of the beaches for further activity later on. As such it was very successful.

On returning to H.Q. orders were received that all H.Q. personnel not directly employed in conduct of the battle were to report near the beach at 21.00 hours and proceed to England.

As disposition of motor ambulances had been made, and all field ambulances less rear parties had left, there appeared to be no object in remaining. I therefore disposed of my kit, drove to the report centre and had my car put out of action. After a somewhat tedious walk along the soft sand to Bray Dunes, a jetty made of planks placed along derelict vehicles loomed out of the darkness. This led to some small boats which conveyed the party to a destroyer. This vessel, H.M.S. "Vivacious," earlier in the day had been struck by a shell which had not only killed several men but had destroyed the "degaussing" apparatus, which made the presence of magnetic mines very unpleasant. Despite these misfortunes and sleepless nights, nothing could have been kinder than our treatment by officers and crew. After hanging about till 04.00 hours, to pick up men from the La Panne beach, it went to Dunkirk and narrowly escaped being hit by bombs as it entered the harbour. Undeterred, it went alongside the mole, and after filling up with walking wounded conveyed us without further incidents to England.

It is realized that the above account is sketchy and lacking in administrative details, orders, etc., but the experience gained during these three weeks of mobile warfare have led to certain conclusions, which it may be of value to summarize.

(1) *Evacuation of R.A.P.s.*—This was never done by hand carriage. One of the few advantages of a retirement is that heavy artillery has not

time to come into action, and particularly in urban areas motor ambulances can easily reach the R.A.P.s. In fact, one was usually kept there in the case of large units. This was particularly valuable when a retirement was imminent, and though it led to the loss of some vehicles it certainly saved men. The casualty rate among the drivers was very low, though they ran considerable risk. During the final evacuation of a position various unit vehicles were also used to bring back wounded. The latter stood it well on the whole, and were transferred to a motor ambulance as soon as one was available.

(2) *Casualties in a Column en route.*—Where time permitted, motor ambulances were always distributed throughout the column to deal with air-raid casualties. Even when normal traffic discipline broke down, and the roads were congested with transport from several different formations, the results of dive bombing and machine gun attacks from the air were surprisingly mild; relatively few casualties resulted.

(3) *Ambulance Transport of Field Ambulances.*—It is impossible to attach motor ambulances to units and at the same time leave the field ambulances enough for their own needs. When the position was stabilized the M.A.C.s worked well, but during retirements it is not easy to locate the H.Q. of a M.A.C. and motor ambulances which have gone back to a C.C.S. may be unable to return. Under such circumstances holding a Section of a M.A.C. under control of the A.D.M.S. proved most valuable. This saved many wounded from the enemy during the withdrawal from the River Dendre position.

(4) *Handling of Field Ambulances.*—Experience proved the importance of never “opening up” more dressing stations than were required. One field ambulance was always kept “on wheels” and able to move at very short notice. It was found useful to get at least one field ambulance away as early as possible, so that it could form a M.D.S. in the new area in plenty of time. When the move is a long one an intermediate A.D.S. to give assistance to casualties accompanying the retiring troops is often useful, but the O.C. must be alive to the possibility of staying too long in position and being left behind.

The hour for withdrawing an A.D.S. is often difficult. If withdrawn in good time, there is nothing to deal with wounded, often at a critical time. If allowed to remain too long, it may be captured or at least get in the way of fighting troops, which may require all available road space.

The most satisfactory method was to “hang it” on to the nearest Brigade H.Q. The Brigade Commander was asked to notify the A.D.S. when it should move. A D.R. or runner from the A.D.S. was temporarily attached to Brigade H.Q., and so was on the spot to bring the vital message without delay.

The A.D.S., of course, is emptied, and kept as empty as possible, and “thinned out” so that it is finally reduced to little more than a car post.

The converting of a M.D.S. into an A.D.S. was never resorted to. Orders

to do so tend to be confusing to a C.O. as different personnel man the A.D.S.s. A process of "thinning out" the M.D.S. before retirement is preferable.

When the area occupied by the Division is small it is often an advantage to cut out an A.D.S. altogether, the casualties being sent direct from R.A.P. to M.D.S.

(5) *Siting of M. and A.D.S.s.*—The H.Q. Staff like this to be done in advance from the map—it makes the Operation Instructions tidy and all units know where to find medical help. The objection is that the map location may be quite unsuitable for opening a D.S. This objection may be met by letting the O.C. Field Ambulance choose his own site. Against that, he may go to the wrong area, and there is delay in units finding him. A compromise is best. Having found out from "G" the position which is to be taken up by the fighting troops, an exact location, such as a church, in what appears to be a suitable village is chosen on the map for the M. and A.D.S.s and the O.C. Field Ambulance informed, and ordered to send on a reconnaissance party. On arrival they find a suitable site, and if it is near the church or fixed point, place directing pointers and red crosses leading to the M.D.S. Or a guide can be posted at the church.

On one occasion, when the A.D.S. was near a cross roads, the O.C. posted one of his men there as a traffic policeman. He did useful work and his red cross brassard caught the eye of anyone looking for the A.D.S., to whom he was able to give the necessary directions.

The marking of the sites of A.D.S.s is most important. Directing posts are necessary on every road leading to it, and it should be marked by a generous-sized red cross as well as the Divisional sign and unit number.

By night the way to an A.D.S. can be shown by means of a 4 gallon petrol tin, in the side of which a cross and directing arrow are cut. The holes are covered with red paper and a hurricane lamp put inside.

Another important point is that the O.C. each field ambulance must inform the A.D.M.S. at once of the location, not only of his A.D.S.s but of his own headquarters, even when he is not forming a M.D.S. Of course, for this, he must know where the A.D.M.S. is, and so the latter must inform all Field Ambulance Commanders in advance of the new location of Divisional H.Q. The situation of his own office should be marked by a notice board, and when he is out visiting, his D.A.D.M.S. must remain "at home" to deal with callers, and to impart and receive information.

The O.C. an A.D.S. must, of course, get in touch with the R.A.P.s that he will serve and inform the unit M.O.s at once of his exact position.

(6) *Intercommunication.*—In the fog of war, which is liable to be thick during rapid retirements, not only may it be difficult to know where people are, but to get in touch with them. It is a wise plan for the A.D.M.S. to borrow two D.R.s from the field ambulances and keep them attached to his office. Even when on the move at least one of them should follow his car. He is then independent of the telephone (which at times of crisis is usually so congested with calls as to be of little practical value) and is able to send information and orders without delay.

(7) *Orders*.—A well arranged “ R.A.M.C. Operation Order ” is a good thing, as it enables one to remember exactly what orders have been given, it gives other members of the staff an accurate idea of medical arrangements and adorns the War Diary. But it takes time to write and have typed. During these operations such time was not often available.

The most satisfactory plan is to impart by D.R. information of an impending move as soon as it is received, and follow it up by a conference of Field Ambulance Commanders in the A.D.M.S. office, or, if all three field ambulances are close together, in the office of the most central one. Plans which have been thought out in the meantime can be explained in detail and questions answered.

(8) *Co-operation*.—There was an excellent rule in the Division that everyone should give help when asked, whether it was their job or not. The medical units, including the Field Hygiene Section, acted up to this principle. On one occasion the M.D.S. was filled almost entirely with wounded from other divisions. I consider this spirit of co-operation most important.

O.C.s Field Ambulances had orders never to refuse help. If they felt that they were being imposed on they were to do the work first and complain afterwards.

It is freely admitted that the majority of the above deductions are neither new nor original. But the activities of the B.E.F. in this war have been so different from what they were in the last that at least a different emphasis is required.

Mechanization alone has altered situations : a move of 60 or 70 miles in a night can now be carried out, and the prevalence of attacks from the air presents new problems.

To sum up what I consider the most important lessons learned :—

- (1) Collecting or giving of the maximum amount of information available, particularly as regards location of units.
- (2) Generous flagging of M. and A.D.S.s.
- (3) Ensuring that plenty of Motor Ambulances are at all times available, and that none ever go to the rear empty.
- (4) Co-operation.

It is customary to conclude an article in the *Journal* with thanks to various individuals.

I should like to thank the officers and other ranks of the medical units under my command. They never failed to respond willingly to any call made upon them, and under trying conditions upheld the honour of both the R.A.M.C. and the Division.

# A REPORT ON THE FIRST THOUSAND CASES WHICH ATTENDED THE EAR, NOSE AND THROAT DEPARTMENT OF A MILITARY HOSPITAL.

BY MAJOR DAVID H. CRAIG, F.R.C.S.Ed.,  
*Royal Army Medical Corps.*

THIS hospital is situated in a training area. During the first nine months of the war there have been over three thousand attendances at the Out-Patients Department, of which number more than fifteen hundred were new patients.

This report on the first thousand cases seen represents a cross section, as it were, of the condition of the ears, noses and throats of the men of military age of this country and the Dominions in training in the British Army. It is noteworthy that in these thousand cases there was only one malingerer.

The following table gives the distribution of the cases :—

AURAL CASES.									
Otitis Media.	Chronic Suppurative	..	..	..	..	..	..	..	243
Otitis Media.	Acute	..	..	..	..	..	..	..	56
Otitis Externa	..	..	..	..	..	..	..	..	34
Furunculosis	..	..	..	..	..	..	..	..	17
Cerumen	..	..	..	..	..	..	..	..	25
Deafness.	(A) Obstructive--								
	(1) Associated with obstruction of the Eustachian tube and naso-pharyngeal sepsis. (Chronic Adhesive Otitis Media)	..	..	..	..	..	..	..	70
	(2) Otosclerosis	..	..	..	..	..	..	..	37
	(B) Perceptive. (Nerve Deafness)	..	..	..	..	..	..	..	14
	(C) Malingering	..	..	..	..	..	..	..	1
Foreign Bodies	..	..	..	..	..	..	..	..	3
Inflamed Sebaceous Cysts on Lobe of Ear	..	..	..	..	..	..	..	..	2
Perichondritis of Auricle	..	..	..	..	..	..	..	..	1
Total									503
NASAL CASES.									
Nasal Sinus Infection--									
	(1) Acute Frontal Sinusitis	..	..	..	..	..	..	..	49
	(2) Acute Maxillary Sinusitis	..	..	..	..	..	..	..	8
	(3) Chronic Sinus Infection	..	..	..	..	..	..	..	83
Nasal Polypi	..	..	..	..	..	..	..	..	15
Deflected Septum	..	..	..	..	..	..	..	..	72
Epistaxis	..	..	..	..	..	..	..	..	33
Hypertrophic Rhinitis	..	..	..	..	..	..	..	..	8
Atrophic Rhinitis	..	..	..	..	..	..	..	..	2
Eustachian Catarrh	..	..	..	..	..	..	..	..	22
Fractured Nose	..	..	..	..	..	..	..	..	8
Total									300
THROAT CASES.									
Infected Tonsils	..	..	..	..	..	..	..	..	102
Laryngitis	..	..	..	..	..	..	..	..	21
Chronic Pharyngitis	..	..	..	..	..	..	..	..	5
Laryngeal Stenosis (following Diphtheria)	..	..	..	..	..	..	..	..	1
Carcinoma of Œsophagus	..	..	..	..	..	..	..	..	1
Total									130
Negative Examinations	..	..	..	..	..	..	..	..	67
Total									1,000

More than 50 per cent of the cases seen were aural, and of this number again practically half were chronic suppurative otitis media. Very few of such patients, in the absence of an acute exacerbation, complain about a condition which they have come to accept as a part of their natural lives. It would appear that active service conditions do not specially predispose to such acute exacerbations (though many patients with chronic suppurative otitis media who attended the Department after the evacuation from Dunkirk stated that the effect of explosions was more severe on them than on their healthy comrades, and in many cases caused intense dizziness), hence it was only those cases who had been detected by a vigilant medical officer, or who had such a degree of deafness as to attract the attention of an exasperated drill serjeant, who were referred to this Department. It is likely that the incidence of chronic suppurating ears among the troops in the area is actually much higher than the actual figures relate. Which is rather a melancholy reflection when one considers that efficient local treatment in the early stages of an acute otitis media would render the chronic ear non-existent.

From a military point of view, such cases represent a loss of efficient man-power, potential sources of infection to their comrades, and prolific sources of future claims for compensation. In many cases though the patient had an obviously long-standing chronic ear, no note to this effect was found on his medical history sheet, and it would seem that a routine examination of the drum-heads on enlistment is not always made.

While it is well known to otologists that adequate local treatment will permanently clear up at least 60 per cent of chronic suppurating ears, the profession is as a whole less familiar with the good results which can be obtained or the methods to be used. It has even been argued that since relatively few such patients develop complications, in the absence of marked deafness no treatment is required. Lieutenant-Colonel Goldsmith, C.A.M.C., stated at a discussion on War Injuries and Neurosis of Otological Interest at the Royal Society of Medicine, in February, 1917, that "because a man has a discharge from his ear it does not follow that he will go sick with it, and it does not do to say that he is liable to mastoiditis or brain abscess or acute labyrinthitis since he is much more liable to be shot."

I feel that to take such a view is short-sighted, especially when it is possible to restore the majority of such cases to full efficiency. The improvement in a man's outlook and general condition, and what is more important, his hearing, is often striking when a chronic suppurating ear has been cleared up.

The remarks of Lieutenant-Colonel Barrett in his report on Diseases of the Ear, Nose and Throat in the Army in Egypt in 1915, are still true to-day, and are worth remembering. He says: "the results have been remarkable, and every specialist in Egypt has been impressed with the fact that chronic otitis media with foul discharge has been brought under control and often cured in a few weeks."

Since it is difficult in this country under existing conditions for all such cases to attend special centres, the problem must remain largely one for the individual medical officer to deal with. It must be stressed that in order to obtain good results he must carry out the treatment himself, and not entrust it to orderlies. An efficient electric auriscope is a most necessary instrument.

A simple method of treatment which can be adopted is as follows : The first essential procedure is to mop all the discharge thoroughly away, so that the perforation of the drum-head and the condition of the mucosa of the middle ear can be clearly seen.

The pinna is grasped between the fingers and thumb of the left hand and drawn upwards and backwards so as to straighten the axis of the external meatus. A wisp of cotton-wool twisted into a wooden carrier is gently insinuated with a rolling motion into the depths of the meatus. No force is used and no pain should be caused.

When all the discharge is cleared away, any granulations may be touched with 10 per cent silver nitrate on a cotton-wool mop and iodine and boric powder (0.75 per cent iodine) is blown into the meatus. This should be repeated daily, and if thoroughly and conscientiously carried out will clear up very many chronic ears.

*Acute Otitis Media.*—Fifty-six cases of acute otitis media were treated; eight of these were operated on for acute mastoiditis. All cases were given sulphanilamide, 2 grammes as an initial dose, followed by 1 gramme t.i.d. for a period of about seven days depending on the severity of the case. A paracentesis was performed as soon as it was judged that pus was present in the middle ear, or in those cases which had perforated spontaneously if drainage was deficient; no attempt was made to delay or avoid it. Locally the ear was dressed with half-inch wide ribbon gauze impregnated in acriflavine 1:1000.

All cases remained under treatment until the ear was completely dry, the drum healed, and the hearing restored to normal. Any primary septic focus, such as infected tonsils or infected nasal sinuses, was dealt with at a later date.

*Deafness.*—In addition to cases of chronic suppurative otitis media or cases due to wax, 122 other cases of deafness were referred for an opinion. One patient only was malingering. He simulated nerve deafness with a considerable amount of ingenuity. It was only possible to communicate with him, when in the best Lewis Carroll tradition one said it very loud and clear and went and shouted in his ear, and he replied in the loud unmodulated bellow so often found in nerve deafness, and denied hearing any tuning forks either by air or bone conduction.

But in his eagerness, he over-acted his part a little, and suspicion was aroused by the way he sat staring at the floor and avoiding one's gaze, quite unlike the usual attitude of a deaf man. Further, when the noise box was suddenly and unexpectedly started close to his ear, he blinked, i.e. cochlear

palpebral reflex was normal, showing that he had heard the noise though he denied doing so. He was admitted to the wards for observation, and for a few days maintained his exhausting pose, but during a film entertainment, he was so amused by Drs. Laurel and Hardy, that he laughed uproariously and abandoned his deception.

Of the fourteen cases of nerve deafness examined, one was absolute, and the patient could hear no sound at all; this was a sequel to cerebro-spinal fever, the only such condition observed among one hundred and twenty cases of this disease treated in the Isolation Hospital.

One hundred and seven cases were of middle-ear type. While thirty-seven gave a definite family history and were clearly otosclerosis, seventy were associated with nasopharyngeal sepsis, obstructed Eustachian tubes, and had scarred and retracted tympanic membranes. Many were of long standing, or gave a history of progressive deafness in spite of treatment in civilian life. Consequently in only a few patients, where there was a likelihood of improvement rather than a hope that further deterioration in hearing might be prevented, was treatment undertaken. The hearing of many of these patients had become worse since they joined the Army, the exposure to cold and damp which active service inevitably entails—especially as at the beginning of the war, when many troops were under canvas or in rather improvised billets—reacted unfavourably on these patients.

Most of the patients who were referred for an opinion on their deafness had a considerable degree of impairment of hearing, and were reduced to a lower category; many, on the recommendation of a Medical Board, were discharged from the Army. While it is perhaps difficult to lay down for the guidance of such boards, precisely what acuity of hearing a man must possess for the various categories, in the same way as the visual acuity is defined, the suggestions made by the Canadian Army Medical Service in the last war are pertinent.

The Canadian Regulations were as follows:—

*Category A.*—A soldier who can hear 15 feet or better in each ear by the ordinary voice, and who has no organic disease of his ear shall be placed in Category A. A soldier who has hearing of 21 feet in either ear, but has little or no hearing in the other ear, but without active disease, shall be placed in Category A.

No soldier with a discharge from his ear shall be placed in Category A.

*Category B.*—A soldier who has hearing of 15 feet in either ear and has little or no hearing in the other ear, and has no active disease in either ear will be placed in Category B. A soldier who has better hearing than 12 feet in each ear but who has a discharge from either ear of moderate degree, or is subject to frequent recurrent discharge from the ears of moderate degree, shall be placed in Category B.

*Category C.*—Soldiers who show symptoms of chronic ear disease, such as hearing reduced to less than 15 feet with freely discharging ears, shall be placed in Category C.



*Category E.*—Soldiers who show signs of recurring serious ear conditions, such as mastoid pain, free formation of granulation tissue or other indications of bone disease shall be reported on by an otologist with a view to being placed in Category E for discharge as permanently unfit.

These regulations cannot be regarded as more than an attempt to deal with the problem. The importance of an ability to localize sound which necessitates equal hearing in two ears, is disregarded, and it must be remembered that a discharge from the ears, which is laid down as an impediment to placing a soldier in Category A, does not necessarily indicate any disease in the mastoid or middle ear, but it may be due to chronic external otitis which can be readily cleared up by appropriate treatment.

No attempt is made to identify those individuals suffering from middle-ear deafness due to chronic adhesive process who, experience has shown, will suffer serious and rapid deterioration in their hearing if exposed to wet and cold.

A simpler and perhaps better method of categorizing these patients would be as follows: In order to obtain approximately standard results (and without most elaborate equipment only approximate results can be obtained) the patients should be examined in a quiet room, away from distracting noises. A noise box should be placed on the ear not being tested, and the examiner should use the forced whisper, rather than his normal speaking voice. The patient is asked to repeat a series of test words. The examiner should stand at first at least 12 feet away and come nearer. Such words as "father," "brother," "potato," "tomato," "sister," "sixty-six" are useful, and cover the auditory scale fairly completely. The use of a watch in testing hearing is not advised.

*Category A.*—All individuals with normal drums, and with a normal nasopharynx, who can hear a forced whisper at 10 feet or better in each ear.

*Category B.*—All individuals who have a unilateral chronic suppurative otitis media, with normal hearing in the sound ear, and who can hear a forced whisper in the affected ear, at a distance of not less than 3 feet.

*Category C.*—All individuals with bilateral chronic suppurative otitis media who can hear a forced whisper at 5 feet in the better ear.

All individuals with middle-ear deafness due to a chronic adhesive process who can only hear a forced whisper in either ear at a distance of less than 5 feet.

*Category D.*—All individuals complaining of deafness or who have a discharge from the ears should be examined by an otologist, and if necessary subjected to a period of treatment under expert supervision.

*Category E.*—All cases of chronic adhesive otitis media who hear the forced whisper at under 2 feet.

Cases of bilateral chronic suppurative otitis media who hear the forced whisper at less than 1 foot in each ear, and who in the opinion of an otologist are unlikely to respond well to treatment.

*Foreign Bodies.*—An unusual foreign body removed from the external

auditory meatus was a molar tooth, which had been inserted in childhood and had remained there for eleven years. It had inflicted no damage on the meatal walls and was accidentally discovered when an accumulation of wax was being syringed away.

*Nasal Cases.*—The bulk of the nasal cases seen were infections of the accessory sinuses. A feature was an epidemic of cases of acute frontal sinusitis, nearly all the cases occurring in about a month. There was no obvious explanation of this rather curious feature.

The Australian troops when they first landed suffered severely from upper respiratory infections, many men with very severe colds, acute sinus infections or acute otitis media were seen; probably a result of a long sea voyage, with the inevitable lack of exercise, close billeting, and probably poor ventilation which a rigid blackout on board ship would entail.

There were fewer cases of chronic sinus infection than one is accustomed to see in civilian practice. Most of the patients so afflicted came from the big cities in the industrial areas, especially from the Midlands of England.

Patients with deflected nasal septums who had got along very satisfactorily in civilian life, found that their nasal air way was insufficient for the more exacting physical demands of the Army, and a complaint very frequently made was that of difficulty in wearing a respirator.

The cases of Eustachian catarrh occurred in the Air Force personnel. These were mild in degree, and in civil life treatment would probably not have been sought, but under the exacting conditions of high flying and rapid descents to a lower level, pain and discomfort were often considerable.

The underlying cause of such catarrh varied. Infected tonsils, infected nasal sinuses, and perhaps most often a deflection of the nasal septum, were the lesions found requiring treatment. But in a considerable number of cases a severe cold caused a catarrhal condition of the Eustachian tubes which persisted in a surprising way and required repeated inflation.

The cases of infected tonsils were not those admitted into the general wards with acute tonsillitis or with Vincent's angina—these were many—but only those individuals in whom a dissection of tonsils had been advised.

The criteria adopted in diagnosing infection in the tonsils were: (1) repeated attacks of acute inflammation; (2) liquid pus in the crypts of the tonsils, which could be squeezed out under pressure. No attempt was made to subject such discharge to microscopic examination, but the rather cheese-like concretions so often found in tonsil crypts were not regarded as being pathological; (3) injection of the anterior pillar of the fauces, and enlargement of the jugulo-digastric gland. No attention was paid to the dimensions of the tonsil, and in the absence of any of the above findings, tonsillectomy was not advised for any of those conditions in which the clinician is anxious to detect a septic focus.

The cases of laryngitis came as a minor epidemic in quite a short period. All were curiously alike in persisting, after an acute onset, for quite a long time, in spite of energetic treatment. Six weeks was not an uncommon period for the loss of voice to continue, and even then relapses were frequent.

## ANTI-SCATTER TREATMENTS FOR WINDOW GLASS.

NOTES FROM THE INFORMATION BUREAU OF THE BUILDING RESEARCH STATION

(Continued from p. 33.)

### (3) *Strip Treatments.*

While treatments which are applied all over the glass, such as those described are to be preferred, strips of suitable strong materials spaced apart can often be used with good effect.

Obviously, the wider the strips themselves and the more closely they are spaced, the better. Provided the strips are at least  $1\frac{1}{2}$  inches wide and are crossed one over another they may be placed up to 4 inches apart. If narrower strips are used or if the strips are not crossed, they must be placed closer together.

When using proprietary materials in strips, the manufacturers' recommendations should be followed.

Suitable materials for strip application include :—

(1) The transparent cellulose and cellulose acetate films mentioned in 2 above, particularly the self-adhesive varieties. After applying strips of these materials it is recommended to varnish over the whole area of the glass.

(2) Self-adhesive cloth tapes—pressing these on the glass with a warm iron helps them to stick better.

(3) Any strong textile material stuck on the glass.

(4) Metallic strip applied with a suitable adhesive.

One such which has been tested and approved is "Perma Led," supplied by Perma Led Metal Co., Ltd., 41, King William Street, E.C.4.

Thin brown paper is not very effective but stout brown paper strips, closely spaced and well stuck to the glass, will provide some protection.

### (4) *Liquid Coatings.*

A large number of liquid preparations based on rubber latex or synthetic resins have been placed on the market as "anti-shatter" coatings, but the general impression gained at the Station as to their value has not been very favourable since so many of those tested have been either ineffective in the first instance or have become so after a few weeks on the window.

The standard of durability which is at present adopted in tests on these liquids at the Building Research Station is that they should retain their efficacy for at least four months under normal conditions of exposure. In the case of rubber latex compositions, no accelerated ageing test is yet available which would serve to show whether a material submitted is likely to have the necessary durability; hence it is necessary to rely on natural exposure for four months before approval can be given.

In the case of synthetic lacquers, however, a heating test has been devised which serves to eliminate the more short-lived materials. If a material passes this test the Station is prepared to receive any authentic evidence which the manufacturers can furnish regarding its durability for consideration with a view to granting provisional approval.

So far, two materials, named below, have been found under actual test to remain effective for at least four months and there are some half dozen others which have given promising results under the heat test ; these are being further investigated.

The two approved materials are :—

(1) "Arpco."—The Calico Printers Association Ltd., St. James Buildings, Oxford Street, Manchester, 1.

(2) "Slick."—Slick Brands Ltd., Waddon, Croydon.

It cannot be too strongly emphasized, however, that to be effective and durable these materials must be applied so as to give a fairly thick coating. A thickness of not less than  $\frac{1}{1000}$  inch should be aimed at and this means at least two good coats, in addition to any priming treatment recommended, should be applied.

A lack of durability may not be so serious a matter if a fresh coat of the liquid is applied from time to time, say about every two months. The need for this, however, may not always be apparent, since treatments often become ineffective (by becoming brittle) without any change in their appearance.

For large panes of glass, liquid treatments alone are not recommended ; in general, some other means of protection should be adopted, but a liquid treatment might be used in a supplementary capacity, e.g., for treating areas of clear glass between strips of material such as those mentioned in (3) above. It is also possible to reinforce a liquid treatment by embedding a textile netting or transparent film in the coating.

#### APPENDIX.

##### TEXTILE NETTINGS.

The preparation of a standard specification for textile nettings for window protection is under consideration. This specification may have the result of bringing about an increase in the degree of protection provided by netting treatments.

In the meantime, the following nettings have been approved on the basis of present tests :—

NAME AND ADDRESS OF MAKERS.	NUMBER OR DESIGNATION OF NETTINGS APPROVED.
R. E. Ashworth & Co. Ltd., 37, Stoney St., Nottingham	(i) "Sunenta" large squares (ii) " " small " " (iii) " " patterned
Wallis Binch, New Basford, Nottingham	(i) No. 22 (ii) No. 7682

*Anti-Scatter Treatments for Window Glass*

NAME AND ADDRESS OF MAKERS.	NUMBER OR DESIGNATION OF SETTINGS APPROVED.
Black Bros. Ltd., Stoney St., Nottingham	Anti-splinter net
Carey & Sons Ltd., 45, Broad St., Nottingham	Splinterproof Nets Nos. 9643 027743 22 810573 0210135
Edward Cope & Co. Ltd., High Church St., New Basford, Nottingham	No. 72 or No. 147
Daybrook Fabrics Ltd., Youngs Factory, Alfred St. South, Nottingham	(i) Dessanita Quality No. 1 (ii) „ „ No. 2
John Dickinson & Co. Ltd., Home Park Mills, Kings Langley, Herts	“ Splinternet ”
Dobsons & M. Browne & Co. Ltd., DelBeta House, Nottingham	(i) No. GF 3698 (ii) No. GF 3958 (iii) No. 10489, GF3169½
Fryman & Fletcher Ltd., Clyde Works, Denison St., Nottingham	Splinterproof Nets Nos. 75894 75803 75763
M. Jacoby & Co. Ltd., Nottingham	No. 9387
Alexr. Jamieson & Co. Ltd., Darvel, Ayrshire	No. 7505
Harry Johnson (Nottingham) Ltd., 38, St. Mary's Gate, Nottingham.	No. 4508
Key A.R.P. Products, Keystone House, Adeline Place, W.C.1	Splinterproof White netting
W. J. & T. Lambert & Co. Ltd., Talbot St., Nottingham	(i) Back glued net (ii) Impregnated net (iii) Mosquito net
Levin Bros. & Co. Ltd., Middle Pavement, Nottingham	(i) No. 9061 (ii) No. 9062
Alex. Morton & Co. Ltd., Darvel, Ayrshire	Anti-splinter nets Nos. 70 70/1
R. Newbold, Kayes Walk, Nottingham	Anti-splinter, anti-dazzle.
A. & F. H. Parkes (Nottingham) Ltd., Anglo-Scotian Mills, Beeston, Notts.	“ Nuart ” Anti-splinter net.
C. & J. Robertson Ltd., Ladeside Factories, Galton, Ayrshire	(i) No. AS1 (ii) No. AS250
Stirling Bros. & Co. Ltd., Darvel, Ayrshire	(i) No. 14960 (ii) No. 34961/x.
Frank Tatham Ltd., 12, Plumtre St., Nottingham	No. 252
L. O. Trivett Ltd., Trivetts Buildings, Short Hill, Nottingham	(i) No. A 4558 (ii) No. A 4559
Wallace & Co. (Netherplace) Ltd., Nether- place, Newron Mearns, Nr. Glasgow	(i) No. A1 (ii) No. A2

NAME AND ADDRESS OF MAKERS	NUMBER OF SPECIMENS
George Walton & Sons, High Pavement, Sutton-in-Ashfield.	Anti-splinter net
J. & J. Wilson & Co. Ltd., Greenbank Mills, Newmills, Ayrshire	AKP Net No. 890 890A 890A 900
A. Herbert Woolley & Co. Ltd., Not- tingham.	(a) No. 08001 (a) No. 08011 (a) No. 08011

All the above nettings were supplied ready treated with adhesive. In addition the following untreated netting has been tested in conjunction with various separate adhesives and given satisfactory results.

Whiteley, Stevens & Co. Ltd., Stapleford Near Nottingham

Further, the following nettings have been tested in conjunction with special varnishes or lacquers supplied with them for use both as the adhesive and as a subsequent coating, and have been found to be satisfactory:

(1) Beaver Anti-Splinter Varnish and Netting—Beaver Paint Co. Ltd. 20, Tithebarn Street, Liverpool, 2.

(2) Cerrux Shatter Resisting Varnish B 3013 and Penetrating Filler. Nos. 1, 2 and 3.—Cellon Ltd., Kingston on Thames.

(3) Anti-Splinter Lacquer and Netting—A. Hobbs & Sons, Ltd. Bordesley Green Road, Birmingham 9.

(4) Foxchow Shatterproof Coated net and Netting—The Anti-Splinter Co. and Co. Ltd., 21, Abchurch Lane, London E.C. 4.

# NOTES ON THE GEOLOGY OF THE QUATERNARY DEPOSITS OF THE "PIANURA PADANA" (PLAIN OF THE RIVER PO) WITH THE RESULTS OF BACTERIOLOGICAL AND CHEMICAL EXAMINATIONS OF SOME POTABLE WATERS DERIVED THEREFROM.

BY P. R. McNAUGHT, M.D., CH.B., D.Sc. GLASG., D.P.H. CAMBRIDGE.

*Medical Officer of Health, City of York,  
Officer in Charge Hygiene Laboratory, Lines of Communication, British Army in  
Italy, 1918.*

(Continued from p. 40.)

## PHYSICAL CHARACTERS OF WATERS.

As a whole, the waters examined were of excellent quality, clear, colourless and bright, without odour or taste and neutral or slightly alkaline.

## BACTERIOLOGICAL EXAMINATIONS.

*Methods used.*—The routine carried out in each instance was the estimation of the number of organisms per cubic centimetre of water developing on agar plates in twenty-four hours at 37° Cent. and on gelatine in three days at 20° Cent. For *Bacillus coli* tubes of MacConkey's bile salt lactose neutral red peptone water were inoculated with the water. The quantities used were  $\frac{1}{10}$  c.c., 1 c.c., 5 c.c., 10 c.c., 10 c.c., 10 c.c., 64 c.c. Any tube showing fermentative change was set aside, the organisms sub-cultured and their reaction more fully investigated. Each lactose fermenting organism was examined as to (a) Motility. (b) Liquefaction of gelatine. (c) Fermentation of glucose, lactose, saccharose, mannite and dulcitol. (d) Changes in litmus milk after 1, 2 and 15 days. (e) Formation of indol.

The so-called *B. enteritidis* change in milk was investigated by adding quantities of 10, 100 and 250 c.c. to whole milk, heating to 80° Cent. for ten minutes and incubating for one to three days. The organism was not confirmed by further tests, e.g., animal inoculation.

## CHEMICAL EXAMINATIONS.

*Methods employed.*—Thresh's *Examination of Waters and Water Supplies* [5] was taken as a basis and selection made of processes as under:—  
(a) Nitrites—naphthylamine (Hosvay's Test) colorimetric estimation. (b) Nitrates—phenol sulphonic acid and caustic potash—colorimetric estimation. (c) Ammonia—Wanklyn's test. (d) Chlorine-silver nitrate and potassium chromate. (e) Total solids dried at 180° Cent. for one hour. (f) Metals as given by Thresh. (g) Oxygen absorbed from acid permanganate. Tidy-Forchammer process, three hours at 37° Cent. in dark.

(h) Hardness. Soap test. (i) Saline constituents following Thresh's method for calcium and magnesium, sodium being estimated by difference, as there appeared to be no other bases save iron in amounts capable of estimation in any of the water examined. Carbonates and sulphates as given on pages 336-340 (Thresh), second edition.

The combination of acids and bases to form salts were calculated from factors—pages 345.

Total solids less salts calculated gave "Silica, etc."

#### RESULTS OF ANALYSIS OF TOWN SUPPLIES.

The source was usually a deep well, but two cases require special mention. The Veneria supply to Turin is from a filtering gallery more or less horizontal, driven so as to intercept the subterranean flow of water from the mountains. The Faenza is from a spring encountered in boring a railway tunnel and had been chlorinated prior to analysis.

The Cremona water samples had been deprived of their iron by aeration and filtration prior to the chemical examination.

Bacteriologically the waters are of good character, all giving a low count on agar and only one, Treviglio, having a high count on gelatine. Lactose fermenters were detected but once in a single sample from the Sangone supply at Turin. Further examination identified the organism with *B. fluorescens*.

*B. enteritidis sporogenes* was never found, although in most instances litres of water were tested in the course of successive examinations.

#### CHEMICAL CONSTITUENTS.

*Nitrogen as nitrites and nitrates* was usually low, in only one instance exceeding 0.1 per 100,000 in the case of the Voghera well, in which 0.4 was found. The probability of admixture with sub-soil water, suggested by the high chlorine 2.07 is unlikely, since no corroboration is obtained from the ammonia and oxygen consumed figures and even the high chlorine is explicable as we shall see later. The nitrites are probably due to reducing agents ? ferruginous sands.

*Ammonia (Saline).*—Practically none was found except in the Treviglio and Mantova samples. The former 0.005 was associated with 0.010 albuminoid and moderate chlorine 0.59, while the bacterial count, 256, was high. The low nitrate figure taken in conjunction with the Cremona and Mantova figures, 0.05 for Cremona, where no saline ammonia is found, and 0.002 for Mantova, would appear to negative any considerable pollution.

The saline ammonia 0.054 is noteworthy in Mantova samples and is associated with an average amount of albuminoid ammonia and low chlorine, while nitrates have reached the vanishing point. It would, therefore, seem feasible to assume the presence of an agent (possibly a ferruginous sand) reducing nitrates to ammonia. In confirmation we ought to note that sometimes a faint trace of nitrite is found, and occasionally a trace of iron.



The *Albuminoid Ammonia* is variable in the series and may be related to deposits of vegetable debris, which as we have already noticed, are brought to light in borings.

*Chlorine*, as befits strata laid down by fresh water action, is low throughout. Most samples fall below 1, a figure rarely reached in analyses of British waters.

The series indicates that the amount increases from a minimum in the west at Turin (0.4 only), as we follow the slope of the river plain to the east. The soil from which the Turin supplies are derived is largely composed of detritus from the more ancient rocks, largely metamorphic, poor in chlorides. As the edges of the great basin are approached, the saline contents of the waters rise markedly, since the tertiary (Pliocene, Miocene and Eocene) fringing deposits yield salts freely, being ancient marine deposits. Chlorine reaches 2.07 at Voghera and 1.30 at Bologna.

*Total Solids* are very low in the higher reaches, the waters derived from the harder metamorphic rocks (Turin) average 8, while those nearer the periphery (Voghera) average 34, probably due to the greater solubility of the adjoining tertiary formation.

*Oxygen Absorbed*.—The series gives an extremely low average figure, ranging from nil to 0.038 at Cremona, and 0.032 at Mantova, part of which is due to reducing power of inorganic constituents, iron, etc.

*Hardness (Soap Test)*.—Total varies from 6 to 21. Here also the waters from the upper reaches are softer than those from the periphery, or nearer the sea; obviously less carbonate of lime has been available in the neighbourhood of the harder rocks. The deep well at Cremona supplies the highest figure, probably due to the long journey which the water has taken through deposits more or less rich in calcium.

*Saline Constituents*.—The amount of calcium carbonate varies but slightly around the figure 10, being lowest in upper part of the river basin, while magnesium carbonate varies from nil to nearly 6, the maximum again being towards the periphery of basin and in lower reaches of the river. Sodium carbonate is present in most of the waters, except at Voghera and Bologna, both on the Apennine border of the basin, in which waters magnesium sulphate appears, a salt not found elsewhere save at Faenza, also bordering on the Apennines. A fairly high sodium sulphate figure is given by the Voghera samples, 14.20 and 8.81, this too, being most readily explained by the near presence of tertiary marine deposits. Sulphates of magnesium and sodium are frequently found in the waters from the tertiary formations in England.

*Sodium Chloride*.—The remarks made regarding the presence of chlorine apply to this salt also.

#### CONCLUSION.

The taking of average figures for the various districts yield some suggestive results.

(a) *Sulphates* (sodium, magnesium and calcium).—The graph shows

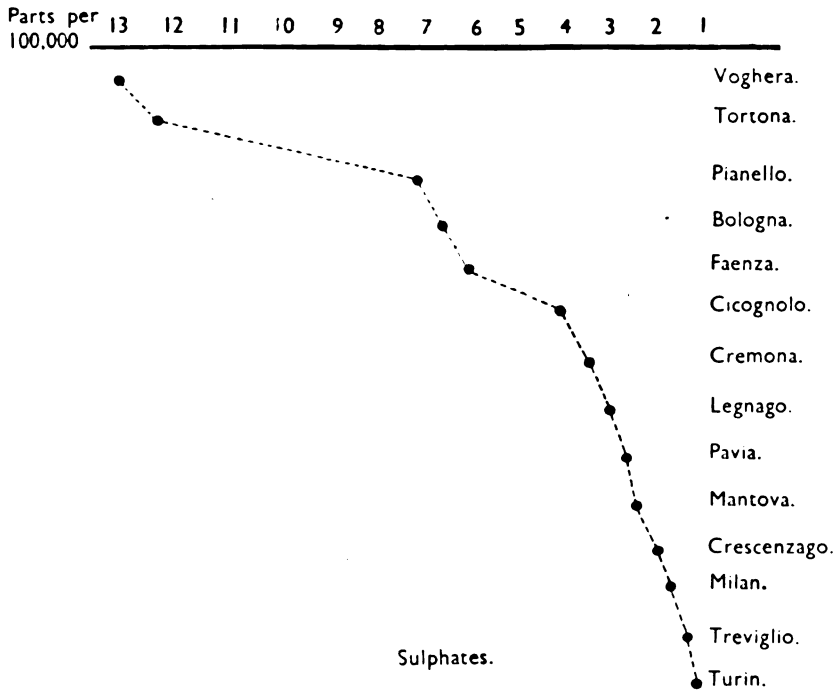


FIG. 4.

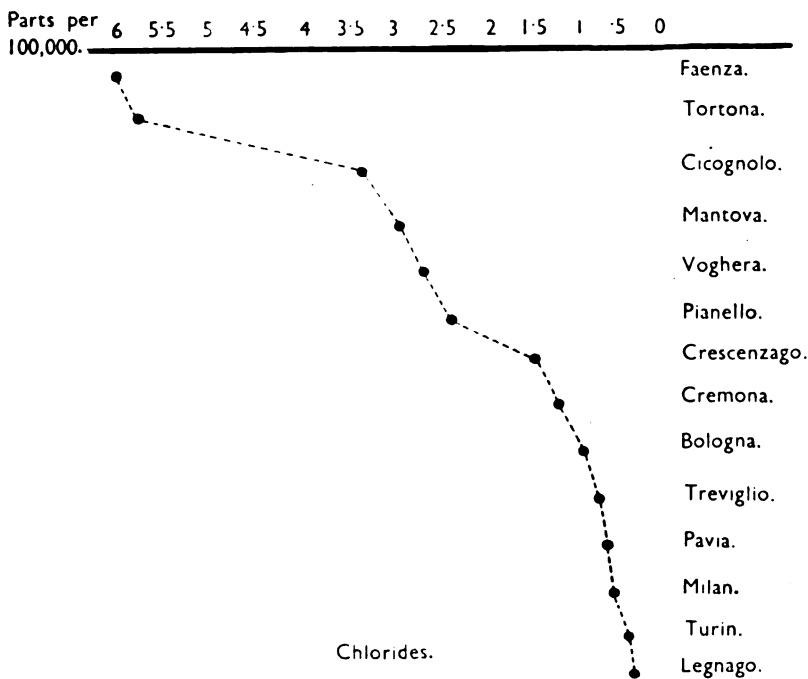


FIG. 5.

at the summit the Voghera and Tortona districts which are in close relationship to the Apennine tertiary deposits.

It falls through Pianello, Bologna and Faenza, also on the fringe of the deposits, and after a decided drop to Cicognolo, Cremona, Legnago, Pavia and Mantova in the more central region of the plain, diminishes still further as the Alpine regions are approached, at Crescenzago, Milan and Treviglio, to a minimum at Turin.

(b) *Chlorides*.—While the curve differs to some extent from that for sulphates, the maximum again falls from the Apennine fringe represented by Faenza and Tortona, through Cicognolo, Mantova, Voghera and Pianello in a rapid descent, until at Crescenzago a fairly flat portion is reached in

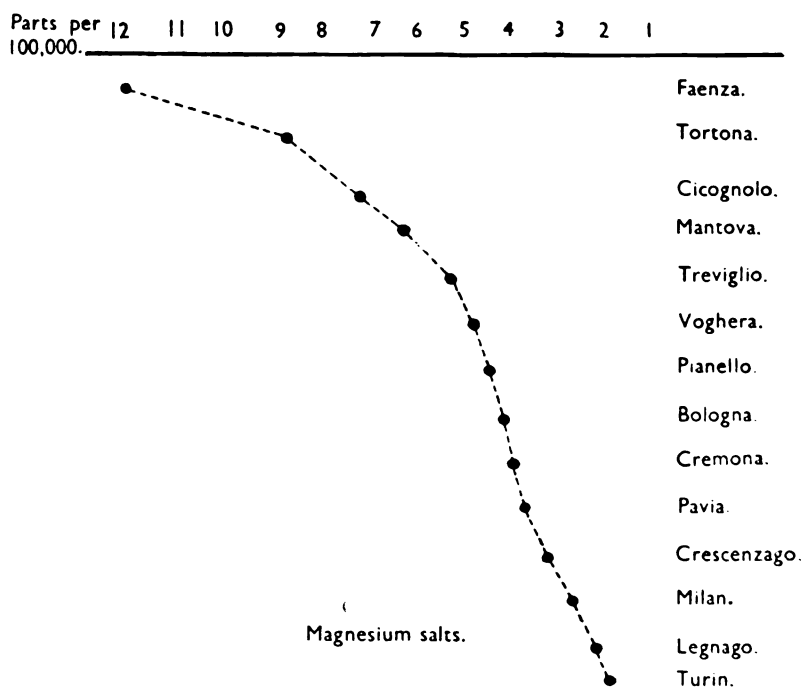


FIG. 6.

which are placed Cremona and Pavia, the central towns of the plain, while a minimum is reached at Milan, Turin and Legnago. Again the Alpine border is characterized by low figures. The position of Legnago in the middle of sulphate series while placed at the bottom of the chloride, deserves notice. The paucity of chlorides is due to the distance of the town from marine formations, while the comparative excess of sulphates may be due to the neighbouring Euganean and Berician hills which are extinct tertiary volcanoes.

Sulphur deposits are common in the regions characterized by volcanic

activity, hence the district of Legnago is in this respect somewhat comparable to the strip of country laying at the foot of the Apennines, for in these mountains are hot springs, mud volcanoes and other evidences of volcanic activity.

(c) *Magnesium Salts*.—Again the position of the various supplies is fairly constant, when this is compared with the previous curves. In fact, comparison of the magnesium and chloride curves shows that the four highest and the three lowest in both practically correspond, and that again there is a gradual descent from high figures on the Apennine to low figures on the Alpine fringe of the basin.

A clear relationship is thus shown to exist between the geological nature of the soil and the waters derived therefrom. The waters from the south of the basin obviously demonstrate their origin from old marine deposits and the amount of magnesium salts, sulphates and chlorides are readily seen to vary inversely with the distance of the source from the Apennine or southern Tertiary boundary of the river basin. As we have already seen, deposits of tertiary formations are rarely exposed on the northern or Alpine fringe, and they appear to be deeply buried beneath great masses of material laid down in Quaternary times. We have already seen that borings failed to reach them at 200 metres in the region between Milan and Venice.

There appears to be a possibility that by careful collection of data something corresponding to "isochlors" could be mapped out, though in this case distance from marine influence can be traced by sulphates and magnesium salts as well as by chlorides.

The saline characteristics of waters clearly originating from the tertiary fringe of Pliocene or Miocene formation, approximate more closely to those of the Lower London Tertiaries, as given by Thresh, than to those of English waters from the Pliocene Crags, Upper Eocene, Barton and Bagshot sands, which are less markedly marine in origin. See results given by Thresh—*Examination of Waters and Water Supplies*—pages 457–460.

Unfortunately, war conditions offered neither time nor opportunity for the taking of a really adequate number of observations, and this paper in consequence is but a disjointed and imperfect contribution to the work hitherto done on Geology in relation to water supplies.

#### REFERENCES.

- [1] FISCHER, T. "La Penisola italiana." Torino, Unione Tipografica Editrice, 1902, p. 351.
- [2] DI POGGIO, E. "Nozioni di Geografia fisica e di Geologia," Firenze, G. C. Sansoni, 1911, p. 131.
- [3] GRASSELLI, G. "Le condizioni igieniche di Cremona." Cremona—Tipografia Sociali 1912, p. 103.
- [4] STELLA, A. "Sulle condizioni geo. idroliche del territorio Cremona rispetto all'estrazione d'acqua dal sottosuolo (Progetto per fornire Cremona di acqua potabile)" Cremona. Tipografia Cooperativa Operaia, 1905, p. 19.
- [5] THRESH, J. C. *The Examination of Waters and Water Supplies*. Second edition. London: J. & A. Churchill, 1913.

## APPENDIX.

RESULTS OF BACTERIOLOGICAL AND CHEMICAL EXAMINATIONS  
OF WATER SUPPLIES.ANALYSIS OF SUPPLIES FROM DEEP WELLS, SHALLOW WELLS,  
FOUNTAINS, FILTERING GALLEY, SPRINGS.

TOWN SUPPLIES. DEEP WELLS. Averages from repeated examinations.

				No. 1	No. 2	No. 3	No. 4
				Turin, Venaria	Turin, Sangone	Milan	Pavia
Colonies agar 24 hrs. at 37°C.	..	..	..	4	14	7	2
gelatin 3 days at 20°C.	..	..	..	13	21	28	8
<i>B. coli</i>	..	..	..	Absent in 100 c.c.	Absent in 100 c.c.	Absent in 100 c.c.	Absent in 100 c.c.
<i>B. enteritidis sporogenes</i>	..	..	..	Absent in 360 c.c.	Absent in 360 c.c.	Absent in 360 c.c.	Absent in 360 c.c.
Parts per 100,000 :							
Nitrous Nitrogen	..	..	..	0	0	0	0
Nitric Nitrogen	..	..	..	-06	-1	-1	0
Saline Ammonia	..	..	..	-0	-001	0	0
Albuminoid Ammonia	..	..	..	-003	-006	-004	-006
Chlorine as Chlorides	..	..	..	-40	-40	-63	-45
Total solids dried at 180°C.	..	..	..	9.41	7.9	16.9	15.06
Metals	..	..	..	0	0	0	0
Oxygen absorbed 3 hrs. at 37°C.	..	..	..	-005	0	-003	-017
Physical characters	..	..	..	Clear, bright, colourless	Clear, bright, colourless	Clear, bright, colourless	Clear, bright, colourless
Hardness : Total	..	..	..	6	6	13	12
Permanent	..	..	..	3	3	4	3
Temporary	..	..	..	3	3	9	9
Probable	Calc. Carb.	..	..	3.12	2.87	9.60	9.10
Saline	Mag. Carb.	..	..	0	1.29	3.16	3.47
constit-	Mag. Sulph.	..	..	0	0	0	0
uents :	Sod. Carb.	..	..	3.94	2.22	1.19	1.06
	Sod. Sulph.	..	..	0	0	.76	0
	Sod. Chloride	..	..	.66	.66	1.04	.77
	Sod. Nitrate	..	..	.36	.6	.54	0
	Silica, etc.	..	..	.47	.27	.52	.35

## TORTONA (Plain).

				No. 12	No. 13	No. 14	No. 15
				Bucket Well	Bucket Well	New Bucket Well	Old Bucket Well
				Via Emilia	Via Passa- lacqua	10 metres deep	20 metres deep
				15.3.18	15.3.18	31.8.18	31.8.18
Colonies agar 24 hrs. at 37°C.	..	..	..	12	272	328	1920
gelatin 3 days at 20°C.	..	..	..	544	5568	816	4800 (2 days)
<i>B. coli</i>	..	..	..	Present in 1 c.c.	Present in 1 c.c.	Present in 5 c.c.	Present in 1 c.c.
<i>B. enteritidis sporogenes</i>	..	..	..	Absent in 360 c.c.	Absent in 360 c.c.	Absent in 360 c.c.	Present in 250 c.c.

TORTONA, Spain—*contd.*

## Parts per 100,000:

Nitrous Nitrogen	0	0	0	01
Nitric Nitrogen	5	21	5	208
Saline Ammonia	002	000	002	000
Albuminoid Ammonia	000	020	004	008
Chlorine as Chlorides	4.81	2.44	1.40	9.70
Total Solids dried at 180°C.	52.50	52.50	48.50	100.00
Metals	1	0	0	0
Oxygen absorbed 3 hrs. at 37°C.	0.18	0.03	0	0.3

Physical characters: Colourless, Colourless, Colourless, Colourless,  
near alkaline near alkaline near alkaline near alkaline

Hardness: Total	22	24	28	34
Permanent	8	5	5	13
Temporary	14	18	22	21
Probable Calc. Carb.	10.47	40.40	21.57	23.80
Saline Mag. Carb.	5.46	3.25	6.62	10.38
constituents: Sol. Sulph.	0	1.68	0	0
Sol. Carb.	9.04	0	5.72	7.18
Sol. Sulph.	14.57	9.85	8.86	28.41
Sol. Chloride	7.93	4.86	2.32	16.00
Sol. Nitrate	3.03	1.27	3.04	12.23
Silica, etc.	—	1.32	0	1.80
Phosphates	3.10	—	—	—

## TORTONA.

	No. 24	No. 24	No. 25
	New Fountain Supply	Source Filtering Gallery	Old Supply from underground cistern
	3.6.18	14.10.18	15.3.18
Colonies agar 24 hrs. at 37°C.	14	19	5
gelatin 3 days at 20°C.	16	528	726
<i>B. coli</i>	Lactose fermenters not <i>B. coli</i> in 10 c.c.	<i>B. coli</i> present in 5 c.c.	Present in 5 c.c.
<i>B. enteritidis sporogenes</i>	Absent in 360 c.c.	Absent in 360 c.c.	Absent in 360 c.c.
Parts per 100,000:			
Nitrous Nitrogen	0	0	001
Nitric Nitrogen	025	004	25
Saline Ammonia	0	0	0
Albuminoid Ammonia	003	020	005
Chlorine as Chlorides	85	1.12	1.37
Total Solids dried at 180°C.	30.00	29.50	48.00
Metals	0	0	0
Oxygen absorbed 3 hrs. at 37°C.	0	0.3	0.13
Physical characters	Colourless, clear alkaline	Colourless, clear alkaline	Clear alkaline
Hardness: Total	20	20	18
Permanent	5	4	7
Temporary	15	16	11

104      *The Quaternary Deposits of the "Pianura Padana"*

TORTONA—*contd.*

Probable	Calc. Carb.	..	..	15.78	—	18.12
Saline	Mag. Carb.	..	..	4.20	—	4.84
Constit-	Mag. Sulph.	..	..	0	—	0
uents :	Sod. Carb...	..	..	1.28	—	4.58
	Sod. Sulph.	..	..	6.22	2 analyses	14.57
	Sod. Chloride	..	..	1.62	—	2.26
	Sod. Nitrate	..	..	.09	—	1.50
	Silica, etc...	..	..	.55	—	2.13

RIVALTA SCRIVIA, near Tortona.

				No. 26	No. 26	No. 27
				Newly Sunk Well	New Well	Pump at Casone
				10 metres deep	10 metres deep	
				9.3.18	22.5.18	9.3.18
Colonies agar 24 hrs. at 37°C.	..	..	..	13	1984	5
gelatin 3 days at 20°C.	..	..	..	4864 (2 days)	6400	1952
	<i>B. coli</i>	..	..	Present in $\frac{1}{10}$ c.c.	Present in $\frac{1}{15}$ c.c.	Present in 1 c.c.
<i>B. enteritidis sporogenes</i>	..	..	..	Absent in 360 c.c.	Absent in 360 c.c.	Absent in 360 c.c.
Parts per 100,000 :						
	Nitrous Nitrogen	..	..	0	.001	0
	Nitric Nitrogen	..	..	.83	.33	.66
	Saline Ammonia	..	..	.015	.004	.075
	Albuminoid Ammonia	..	..	.220	.004	.040
	Chlorine as Chlorides	..	..	.86	.77	.80
	Total solids dried at 180°C.	..	..	35.00	27.50	28.00
	Metals	..	..	0	0	0
	Oxygen absorbed 3 hrs. at 37°C.	..	..	.32	.002	.016
Physical characters	..	..	..	Whitish turbidity, colourless, alkaline	Colourless, clear alkaline	Colourless, clear alkaline
Hardness : Total	..	..	..	20	22	20
Permanent	..	..	..	4	4	4
Temporary	..	..	..	16	18	16
Probable	Calc. Carb.	..	..	17.38	19.67	18.75
Saline	Mag. Carb.	..	..	0	0	0
Constit-	Mag. Sulph.	..	..	0	0	0
uents :	Sod. Carb.	..	..	5.98	2.30	2.21
	Sod. Sulph.	..	..	1.89	.94	0
	Sod. Chloride	..	..	1.52	1.27	1.32
	Sod. Nitrate	..	..	5.04	2.00	4.01
	Silica, etc...	..	..	3.19	1.32	1.71

PAVIA.

				No. 38	No. 39
				Pump	Spring
				18.9.18	near Observatory
					18.9.18
Colonies agar 24 hrs. at 37°C.	..	..	..	11	40
gelatin 3 days at 20°C.	..	..	..	150	250
	<i>B. coli</i>	..	..	Absent in 100 c.c.	Present in 5 c.c.
<i>B. enteritidis sporogenes</i>	..	..	..	Absent in 360 c.c.	Absent in 360 c.c.

PAVIA—*contd.*

Parts per 100,000 :						
Nitrous Nitrogen	..	..	..	..	·001	trace
Nitric Nitrogen	..	..	..	..	·04	·04
Saline Ammonia	..	..	..	..	0	·003
Albuminoid Ammonia	..	..	..	..	·008	·004
Chlorine as Chlorides	..	..	..	..	·60	·48
Total solids dried at 180°C.	..	..	..	..	14·75	20·00
Metals	..	..	..	..	0	0
Oxygen absorbed 3 hrs. at 37°C.	..	..	..	..	·01	0
Physical characters					Colourless, clear, neutral	Colourless, clear, neutral
Hardness : Total					10	18
Permanent					4	5
Temporary					6	13
Probable	Calc. Carb.	..	..	..	5·77	12·20
Saline	Mag. Carb.	..	..	..	2·94	3·49
Constit- uents :	Mag. Sulph.	..	..	..	0	0
	Sod. Carb.	..	..	..	1·68	0
	Sod. Sulph.	..	..	..	2·84	2·34
	Sod. Chloride	..	..	..	·98	·79
	Sod. Nitrate	..	..	..	·24	·24
	Silica, etc...	..	..	..	·30	·94

## CICOGLIOLO. Pumps, Shallow Wells.

					No. 49	No. 50	No. 50
					Well	Well	Well
					19.1.18	1.5.18	29.7.18
Colonies agar 24 hrs. at 37°C.					Innumerable.	208	7
gelatin 3 days at 20°C.					Innumerable.	640	20
<i>B. coli</i>					Present in 1 <sup>1</sup> / <sub>10</sub> c.c.	Present in 1 c.c.	Present in 1 <sup>1</sup> / <sub>10</sub> c.c.
<i>B. enteritidis sporogenes</i>					Present in 10 c.c.	Absent in 360 c.c.	Absent in 360 c.c.
Parts per 100,000 :							
Nitrous Nitrogen	..	..	..	..	·09	0	0
Nitric Nitrogen	..	..	..	..	0	0	0
Saline Ammonia	..	..	..	..	2·05	·02	·004
Albuminoid Ammonia	..	..	..	..	1·00	·03	·010
Chlorine as Chlorides	..	..	..	..	8·97	·56	·93
Total solids dried at 180°C.	..	..	..	..	82·00	28·50	30·00
Metals	..	..	..	..	0	Fe a trace	Fe a trace
Oxygen absorbed 3 hrs. at 37°C.	..	..	..	..	1·2	·013	·04
Physical characters					Pale straw, turbid, sewage odour, alkaline.	Brown, opalescent, no odour, alkaline	Colourless.
Hardness : Total					25	18	22
Permanent					12	5	6
Temporary					13	13	16
Probable	Calc. Carb.	..	..	..	24·38	Average	19·09
Saline	Mag. Carb.	..	..	..	4·84	of two	3·12
Constit- uents :	Mag. Sulph.	..	..	..	0	samples.	0
	Sod. Carb.	..	..	..	25·51	No. 50.	2·05
	Sod. Sulph.	..	..	..	11·04		2·93
	Sod. Chloride	..	..	..	14·79		1·05
	Sod. Nitrate	..	..	..	0		0
	Silica, etc...	..	..	..	1·44		·93



106      *The Quaternary Deposits of the "Pianura Padana"*

FAENZA. Fountain Supply, Spring 1½ litres per second.

				No. 67	No. 67	No. 67
				8.5.18	25.6.18	13.8.18
Colonies agar 24 hrs. at 37°C.	..	..	..	6	7	250
gelatin 3 days at 20°C.	..	..	..	56	25	800
<i>B. coli</i>	..	..	..	Present in 20 c.c.	Present in 30 c.c.	Lactose fermenters not <i>B. coli</i> in 5 c.c.
<i>B. enteritidis sporogenes</i>	..	..	..	Absent in 360 c.c.	Absent in 360 c.c.	Absent in 360 c.c.
Parts per 100,000 :						
Nitrous Nitrogen	..	..	..	·001	0	trace
Nitric Nitrogen	..	..	..	0	·41	·30
Saline Ammonia	..	..	..	·004	·005	·004
Albuminoid Ammonia	..	..	..	·024	·009	·010
Chlorine as Chlorides	..	..	..	6·79	7·65	8·50
Total solids dried at 180°C.	..	..	..	64·00	70·00	69·50
Metals	..	..	..	0	0	0
Oxygen absorbed 3 hrs. at 37°C.	..	..	..	·001	·008	·01
Physical characters	..	..	..	Colourless, clear	Slightly alkaline	
Hardness : Total	..	..	..	28	48	44
Permanent	..	..	..	7	16	10
Temporary	..	..	..	21	32	34
Probable	Calc. Carb.	..	..	—	34·25	Average of three analyses.
Saline	Mag. Carb.	..	..	—	10·80	
Constit-	Mag. Sulph.	..	..	—	·85	
uents :	Sod. Carb.	..	..	—	0	
	Sod. Sulph.	..	..	—	6·16	
	Sod. Chloride	..	..	—	12·61	
	Sod. Nitrate	..	..	—	1·43	
	Silica, etc...	..	..	—	1·71	

ANÆSTHESIA IN WAR.<sup>1</sup>

BY MAJOR J. M. SAVEGE, M.B., CH.B., D.A.,

*Royal Army Medical Corps.*

My subject this afternoon is Anæsthesia in War. Dr. S. T. Rowling, who is well known to us all as Senior Anæsthetist at the Leeds Royal Infirmary, is to deal with Anæsthesia in Peace, and his remarks will be of special value as exemplifying his own personal contributions to anæsthesia. I shall confine myself to Anæsthesia in War, as I saw it during nine months with the B.E.F. in France.

There is, of course, no fundamental difference between anæsthesia in peace and in war. In war, however, certain factors arise, which tend to some extent to modify anæsthesia.

The first of these is that in rush periods, patients tend to conform to one type, i.e. wounded men suffering from various degrees of shock, hæmorrhage and sepsis, and this in itself tends to limit the choice of anæsthetic. In quiet periods, on the other hand, patients do not conform to one type; one has a variety of types of cases to deal with: the acute and interim appendix, excision of knee cartilages, herniotomies, perforated gastric ulcers, even an occasional thyroidectomy—in fact, all the routine peace time variety of cases of an average military hospital; and as the type of case differs, so does the form of anæsthetic employed.

Apart from the type of case encountered, there are other factors which modify the form of anæsthetic employed. Money is all important in war and the cost of anæsthetic agents and apparatus is not irrelevant, although some of us, I think, are only too prone to overlook it. The money available is not provided by voluntary subscribers as in the case of voluntary hospitals, but by the taxpayer, and is limited. Under these circumstances, one cannot, I think, reasonably expect—so long as there is no loss of efficiency—to be provided with the most expensive anæsthetic agents, forms of gas-oxygen machines, and apparatus generally.

A third factor which may influence the type of anæsthetic selected is the portability of anæsthetic agents and forms of apparatus. Both should be simple and easily portable; ether (in cans) can be carried fairly easily; gas in cylinders not so easily; pentothal is eminently portable. The apparatus should be capable of travelling hundreds of miles without breakage, in ship, train or motor lorry, of being carried from one muddy field to another, and of being used in a flooded tent, on rough uneven ground. At

---

<sup>1</sup> A paper read at a meeting of the Leeds and West Riding Medico-Chirurgical Society on August 1, 1940.

least, that was my experience, on occasions, last winter. We were accommodated simply in tents, in fields and orchards, and to start with, our operation theatre was a hospital tent. I remember the first anæsthetic I gave under these conditions was for an acute mastoid. Later on, the operating unit was accommodated in a modern school, but that took some months to accomplish.

As regards personnel we started with one specialist in anæsthetics per 1,200 bedded hospital. Later on, when travelling surgical teams were provided, this was increased to two.

We were provided with most of the usual anæsthetic agents—gas, ether, chloroform, ethyl-chloride, stovaine, percaine (the light variety), novocain and pentothal.

For pre-anæsthetic medication we had atropine, morphine, hyoscine, alopon, alopon with scopolamine and ephedrine.

Adrenalin, pituitrin and coramine were available. Cylinders of oxygen and carbon-dioxide were provided.

As regards apparatus in General Hospitals we had the field pattern Boyle's apparatus for gas-oxygen, gas-oxygen ether, Shipway's warmed ether apparatus, a Junker bottle, Magill's endotracheal tubes and laryngoscope, the usual Bellamy Gardner's ether dropper, Phillip's airways, Clausen's harness, Schimmelbusch masks, and Howard Jones' spinal needles. A simple gas machine with Catlin's bag was also available.

As for the gas oxygen apparatus provided, the field pattern Boyle is British, it is portable, not I believe very expensive, as gas-oxygen machines go, and in spite of its shortcomings, one managed, on the whole, extremely well.

The Shipway warmed ether apparatus, so far as I saw, was not much used, in spite of its popularity in the last war.

As regards choice of anæsthetic, in my opinion the most generally useful anæsthetic agent in war is gas-oxygen with suitable premedication and minimal ether, if required. Second in place of favour, I would place ether given by the open drop method. Our usual procedure was to give morphine and hyoscine one hour before the operation. Though we had several busy days towards the middle of June, our peak period was the day we gave seventy-one general anæsthetics in the theatre for recently wounded men, mostly with their first dressings still in position; men with wounds of all grades of severity. At this period all C.C.S.s for one reason or another had ceased to function. All these cases were given gas-oxygen, gas-oxygen ether or open ether with suitable premedication. In passing, I may say that by this time the blood transfusion unit had joined us and did excellent work in getting cases into the best possible condition for operation. A pre-operative systolic blood-pressure of 100 mm. of mercury was aimed at, so far as possible, and no effort was spared in order to get operation cases into the best possible condition.

Stimulated by a colleague's example, I got into the way of using on the

Boyle the soda-lime absorption technique in the administration of gas oxygen, gas-oxygen ether. It certainly economized gas, and this factor was of some importance as latterly we began to be short of gas, and there was then no possibility of getting any more. This technique conserved the body heat to some extent, and may in this way I think have helped to minimize the possibility of shock production. The soda lime filter was made locally, and we had had the forethought to lay in a fair supply of soda-lime.

Endotracheal methods were invaluable on many occasions. In fact, it was almost routine to pass a Magill's tube. There was at the outset some delay in obtaining these, but later on no difficulty.

As for rectal and spinal anaesthesia, these methods do not hold in war the same place of importance as they do in peace, for obvious reasons. Wounded men resent the preliminary manoeuvres necessitated by these forms of anaesthesia. Spinal anaesthesia is very definitely contra indicated in patients suffering from shock. Full use, however, was made of spinal anaesthesia in quiet periods in suitable cases.

As regards local anaesthesia, this in wounded men may cause oedema, which in turn favours the growth of organisms, and retards healing. It is, therefore, contra-indicated.

As for intravenous anaesthesia, I think we all found pentothal very useful, for the induction of anaesthesia, for painful dressings and so on. Very little was required, and this had to be used with care if the patient was ill. A word of warning, as it contains sulphur it should not be given to patients receiving sulphanilamide preparations.

In quiet times my colleague was in the habit of giving continuous pentothal for abdominal operations, using about 1·2 grammes for an ordinary appendicectomy. The technique was simple. Under strict asepsis an Edwards' vein seeker was filled with sterilized normal saline and introduced into a vein in the antecubital fossa. The vein seeker was strapped down on to the arm. A continuous drip glucose-saline infusion was rigged up (height about 3 feet) on the anaesthetic trolley and led into the vein seeker. It was now a simple matter to introduce the pentothal intermittently into the same vein seeker, adding it from time to time to the glucose saline infusion. The results were very satisfactory, both to the patient and the surgeon: adequate relaxation was obtained and the patients liked it.

As regards anaesthetic sequelae, we had no deaths on the table and no case of death which could be directly attributable to the anaesthetic. Pulmonary complications were infrequent, and we had no case of bronchopneumonia, embolism, or massive collapse of the lung. Headache after spinal anaesthetic was not common.

In conclusion, in this brief and I fear inadequate summary, I would emphasize the need for simplicity and portability of apparatus: the same applies to the anaesthetic agents. In rush periods one has to call upon the occasional anaesthetist, and the less complicated the apparatus

with which he is confronted the happier he will be and the better will be the results. The anæsthetist has to be a man of tact. In addition to metaphorically holding the patient's hand throughout the ordeal of surgical intervention, he has to satisfy the requirements of the surgeon. I personally am all for progress, but in my experience surgeons as a class are rather conservative, preferring the old well-tried methods of anæsthesia to more novel methods. As one very senior surgeon put it to me, when discussing this very point, "My dear fellow, once you encourage that sort of thing, the anæsthetist begins to think he is more important than the surgeon." *Verb. sap.*

## Editorial.

---

### THE BREAD OF THE NATION.<sup>1</sup>

IN *The Times* Sir Wyndham Dunstan writes an article which summarizes and concludes the discussion on Sir William Bragg's article on basal food, which appeared in *The Times* of October 26.

Sir Wyndham Dunstan considers that the authoritative and opportune article of the President of the Royal Society will do much to counteract the confusing effect of unbalanced manifestos about food now made in the name of science. The correspondence which followed Sir William Bragg's article raised some interesting questions, and the letters referred principally to bread. Sir Wyndham Dunstan thinks it is worth while, avoiding technicalities, to consider the principal problem and possible ways of solving it. He points out that to be of real value the material must be digestible—capable of assimilation within the body. In the matter of digestion people vary greatly and there must be latitude in the choice of food. While consumption in quantity of uncooked green and other vegetables is widely advocated, many are unable to digest some vegetables unless cooked, and not always then, save in very moderate amount. Many other factors have to be considered when planning; there are different tastes and preferences. The appeal a particular food makes to an individual and the appetite it stimulates are important points. The psychological factor plays a significant part and must be met by providing as wide a selection of palatable food as possible. Turning to *The Times* correspondence Sir Wyndham Dunstan says it is clear that interest is centred on the kind of bread we should eat, and ought to be made to eat in war-time. There is general unanimity that wholemeal bread, not necessarily the same as "brown" bread, is that which should be readily eaten and readily procured. This is not at present the rule. Should it be made so? The constituents of wholemeal bread supply not only nourishment for the body, but protection against ill-health. Some of the more valuable constituents are absent from the white bread, so long the staple diet of this country, because they have been removed in the conversion of the wheat to white flour, which is now often further deteriorated by chemical bleaching. White bread is therefore a sophisticated and inferior food to which we have become so accustomed that its use has become an ingrained habit. The obvious course in the circumstances and especially in war-time would be to compel the use of wholemeal bread and prohibit white bread. But though such a change would be for the good of the nation, a sudden change of this kind, however beneficial, is bound to be inconvenient, if not distasteful, to many who are attached to white bread,

---

<sup>1</sup>By the late Sir William Horrocks.

and particularly to those who do not, or cannot, understand the need for a change.

There are people who say they digest white bread more easily than "brown." Thus it happens that the Ministry of Food, advised by numerous experts and confronted with numerous objectors, is apparently in favour of the evasive alternative of restoring artificially to white bread one at least of the valuable constituents it has lost in manufacture without impairing its whiteness. At first it was intended to do this by adding to white flour suitable quantities of two chemically prepared substances, one a vitamin and the other a calcium compound. Recently the synthetic vitamin has been indicated as the proposed addition. This seems a clumsy and unnecessary concession to sentiment, involving considerable expenditure. It has been widely criticized and regarded as "faked" bread. An eminent physician while condemning the proposal on general grounds also questions its efficacy. Why first remove a natural constituent of wheat in making the flour, and then, at a cost, add to the flour this constituent artificially manufactured. He presents a convincing case for the use of wholemeal bread.

With regard to the argument that some people dislike wholemeal bread and find it less easy to digest, Sir Wyndham Dunstan doubts whether many of them have eaten true wholemeal. "Brown" breads, including home-made with coarse ground wheat or bran and also several varieties of brown bread under largely advertised names, are almost everywhere procurable at higher prices than white bread. Fine wholemeal flour as well as bread is less easy to find; and the letter in which Mr. Scott recounts his experiences at Oxford can be paralleled in towns throughout the kingdom.

Large numbers of people eat very little bread, and it is therefore of small importance whether it is wholemeal or white. They consume far less than the three-quarters of a pound a day included in Sir William Bragg's basal diet and make it up with other foods which they can afford to buy. A really nutritious bread chiefly concerns the poorer classes, who eat much more bread than those better off. For the poor the substitution of wholemeal bread for white is a matter of far-reaching importance. It has been stated that in many places wholemeal bread is dearer than white, but inquiries in the trade show that this should not be, apart from "fancy" brown breads.

The Ministry of Food confronted with alternatives, apparently favour the introduction of a "faked" white bread rather than the adoption of wholemeal. There is, however, a medium course for this country, and we have come to recognize the inevitability of gradualness, and the medium course would meet present needs, and might lead to the voluntary adoption of all that is required.

It has been found that the admixture with fine ground wholemeal flour of about 10 per cent of white flour makes a light-coloured, very palatable, and digestible bread of good texture. Its nutritive value is very little less than that of full wholemeal bread—in fact a rather higher proportion

of white flour would be permissible. The mixed flour is quite satisfactory for rolls, scones and cakes. If easily obtainable it would lead to a change of taste in favour of wholemeal bread. For the present, white flour (unfaked) should still be on sale, but at a rather higher price than light wholemeal, so that those with a strong preference for white bread will be able to obtain it by paying a little more. Under this plan which avoids "faking" and compulsion, there would be three forms of bread and flour on sale—wholemeal, light wholemeal and ordinary white. The cost of the white flour and bread should be rather higher than that of the two wholemeals, both of which would be sold at the same minimum price. Some arrangements with the trade would be necessary but do not appear to present insuperable difficulties. Regulation of prices charged to the consumer may be expedient; the matter is ripe for decision and it is to be hoped that the Minister of Food in person will now decide on the proper course to pursue even at the risk of being called a "dictator."

In the House of Lords on Friday, December 20, the Minister of Food stated that the Government had arranged through the medium of a rebate on the price of flour a subsidy which would be equal in value to  $\frac{1}{4}$ d. on the quartern loaf to all bakers for all bread sold by them at 8d. a quartern or less.

This scheme would be in operation for not less than three months during which the arrangements for keeping down the price of bread would be reviewed. The scheme would enable bakers who are selling unprofitably at 8d. a quartern to maintain the price and others to reduce the price to 8d. in order to qualify for the subsidy. The cost for the three months would be £750,000; it would be retrospective to December 1, 1940. The Minister could see no further reason for making calls on the Exchequer to keep down the cost of pastries and biscuits, and he was therefore using the new subsidy directly to keep down the cost of living for an essential article in the national diet. He had arranged with the bakers to supply at the same price either a white or wholemeal bread. He had been repeatedly urged to adopt a standard loaf made of wholemeal containing high extraction flour comprising 80 per cent or more of the whole berry. He had decided to adopt 85 per cent extraction as a basis for wholemeal flour, which would be supplied at the same price as national straight-run white flour. This would contain the necessary quantities of B<sub>1</sub> vitamin. The Minister stated that he had been much impressed by the unanimity of scientific opinion on the nutritive value of wholemeal bread and the desire of people not scientists to induce everyone to eat it. Returns obtained at the Ministry from all flour millers in the country showed that the average delivery of all high extraction flour did not exceed 5 per cent of the total delivery of all flour. Reckoning that about 60 per cent of the total flour is used for breadmaking it followed that the total quantity of bread made from high extraction flour was only a little over 8 per cent of the bread consumption in the country. The Scientific



Sub-Committee appointed to advise the Government was aware that brown bread did not keep as well as white, and further—and this was of more importance in war time—high extraction flour did not keep as well as straight-run white flour, and would have to be turned over in store twice as often as white flour to keep it in good condition. In these circumstances the Minister was loath to consider that it was in the interests of the population for the prosecution of our war effort, to have no other choice than to eat bread thus adulterated. He therefore considered that the proper attitude of the Ministry of Food to adopt was to secure that such bread was available in adequate quantity to the public at the same price as white bread, and to draw the attention of the public to the advantages which the Sub-Committee assure him those who ate it were likely to obtain; recognizing, of course, that there were some persons to whom it was not possible as a diet.

With regard to fortifying white flour with synthetic vitamin B<sub>1</sub>, the Minister said that to convert scientific discovery into an enterprise sufficiently large to meet commercial demands was a long process, and supplies of synthetic vitamin B<sub>1</sub> would not be available in quantity until May, 1941.



## Clinical and other Notes.

---

### A CASE OF MULTIPLE BONY INJURIES OF BOTH WRISTS, INCLUDING A FRACTURED CUNEIFORM AND DISLOCATED SEMILUNAR BONE.

BY LIEUTENANT-COLONEL J. C. ANDERSON,  
*Royal Army Medical Corps.*

On December 22, 1939, a man aged 22 fell from the window of his billet whilst sleep-walking. He injured both wrists. The skiagram showed:—

*Left Wrist.*—A comminuted fracture of the lower end of the radius and a fracture of the styloid process of the ulna. Some posterior rotation of the lower fragment remained after reduction.



FIG. 1.—Lateral view showing the semilunar bone to be dislocated forwards.

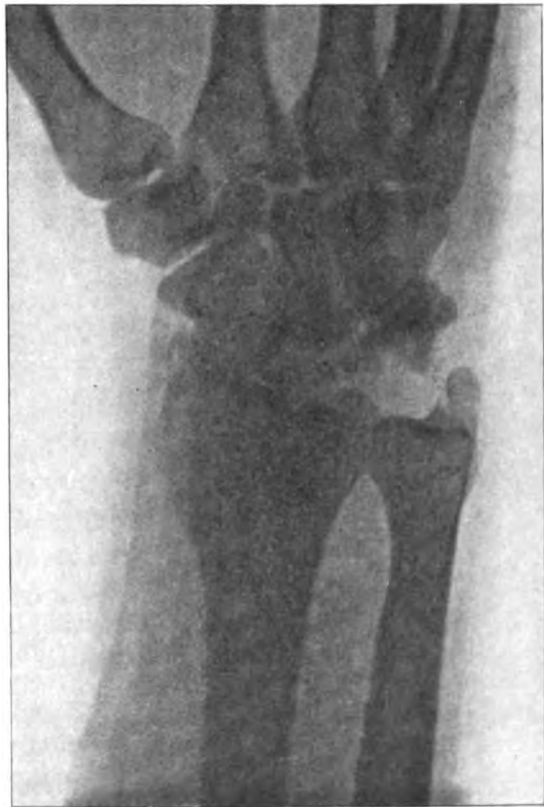


FIG. 2.—Antero-posterior view showing the fractured cuneiform bone and a fracture of the styloid process of the ulna.

*Right Wrist.*—A fracture of the styloid process of the ulna, a fracture of the cuneiform bone, and anterior dislocation of the semilunar bone.

Using a brachial plexus block, I attempted to reduce the dislocated semilunar bone, but got insufficient muscular relaxation.

Under general anaesthesia the dislocation was reduced, simply by pulling on the hand with counter extension applied to the arm. A considerable and continuous amount of effort was required to get the desired result. The technique adopted was that described by Lorenz Böhrer.

Unfortunately, this patient had a complication that is not uncommon in dislocation of the semilunar bone, namely paralysis of the median nerve. The muscles of the hand supplied by this nerve were paralysed, and there was anaesthesia throughout its distribution, but taking into consideration the fact that he had tingling sensations in his fingers, I fully expected the nerve to recover its function of its own accord. Accordingly I was not surprised to note on February 26, 1940, that the muscles supplied by the median nerve had completely recovered. Anaesthesia persisted in the index finger. The other fingers had recovered, and there were signs that sensation was returning to the index finger as well.

---

#### A CASE OF MALARIA, COMPLICATED BY *SALMONELLA THOMPSON* SEPTICÆMIA.

BY CAPTAIN J. GOLBA,  
*Polish Army.*

THE following details describe the features of an interesting case of recurrent malaria in a Polish soldier who developed septicæmia caused by *Salmonella thompson*. According to the classification proposed by the Salmonella Sub-committee of the International Society of Micro-biology, *S. thompson* possesses the "O" antigenic components VI and VII; the specific "H" component K; and the non-specific "H" components 1, 3, 4, 5. (See *Journal of Hygiene*, 1934, vol. 34, p. 333.)

#### CASE HISTORY, WITH CLINICAL AND LABORATORY FINDINGS.

The patient first contracted malaria in October, 1939, whilst resident in Rumania, and subsequently suffered a relapse in July, 1940, after arriving in Great Britain. The ensuing account summarizes the principal clinical features and laboratory findings from day to day.

July 24, 1940: On admission to hospital patient was febrile, temperature 99° F., pulse-rate 80 and respirations 20 per minute. On physical examination he complained of slight tenderness over the spleen and on palpation the organ was found to be greatly enlarged. The Widal reaction was negative and no agglutinins were demonstrable in patient's serum for

*B. typhosus*, para *A. Br. abortus* and *Br. melitensis* and the Weil-Felix test was likewise negative : antigens *B. proteus* X19, ONK and OX2 being employed. Blood-culture was negative at this stage.

July 25 : At night, temperature rose to 105° F., the skin became hot and dry and the patient experienced severe headaches. Tepid sponging was ordered and fever fell to 104° F. where it remained for four hours. Blood examinations carried out at this time showed that white blood cells were 6,000, polymorphs were 66 per cent, and lymphocytes 34 per cent ; no malaria parasites were found in repeated blood films taken throughout the day and night. Microscopic examinations of urine revealed scanty red blood cells and white blood cells.

July 26 : Early in the morning temperature rose to 106° F., fell slightly and was sustained at 105° F. for several hours. Again no malaria parasites were found. In view of the unknown origin of the pyrexia a second blood-culture, Widal and second Weil-Felix test were performed. The results of these were negative, but the blood-culture was positive and a pure growth of *S. thompson* was isolated. The identity of this organism was established through the courtesy of Dr. William Scott of the Emergency Public Health Laboratory Service, London.

July 27 : Clinical examinations of the chest revealed some impairment of the resonance at the right base, accompanied by rhonchi. The highest temperature recorded during the day was 104° F. Urine contains scanty red blood cells and white blood cells. At this time he was seen by Colonel J. M. Mackinnon who immediately prescribed 7½ grains quinine bi-hydrochloride contained in 10 c.c. of saline, with 5 c.c. of adrenalin solution which was administered intravenously. The temperature immediately fell, but remained at 101° F. for four hours, and on further instructions from Colonel Mackinnon it was decided to try the effect of sulphanilamide in three doses of 2 grammes which were given four-hourly. Following this the pyrexia declined and the patient felt much better.

July 28 : Temperature was 99° F., pulse 88 per minute, and his general condition much improved.

July 29 : Progress was maintained, but he complained of a troublesome cough accompanied by sputum and there were indications of consolidation of the right lung ; rhonchi were audible on auscultation. As previously, no malarial parasites could be demonstrated in the peripheral blood and examination of sputum revealed no pathogenic organisms. X-ray examination of the chest showed simple congestion of the lungs but no evidence of consolidation.

July 30 : No change ; sputum was examined for tubercle bacilli but none was found.

July 31 : Patient developed phlebitis of the right saphenous vein. White blood cells were 6,100 per c.mm., polymorphs constituting 49 per cent, lymphocytes 48 per cent and eosinophils 3 per cent. From this time onwards for the next sixteen days recovery was uninterrupted, but on

August 16, he suffered from a relapse; temperature rose to 100° F. accompanied with a rigor and blood films showed large numbers of *Pl. vivax* parasites.

August 4: Bacteriological examinations of the stools failed to reveal pathogenic organisms.

August 17: Temperature was 101° F., malaria parasites were still numerous in the blood and active anti-malarial therapy was instituted.

August 18: Patient felt better and continued to improve until discharged from hospital on August 30. Routine Wassermann and Kahn tests were negative. Before leaving hospital a specimen of patient's serum was tested for agglutinins against *S. thompson* and the homologous infecting organism was found to be agglutinable up to an end-titre of 1:240.

#### SUMMARY.

A strain of *S. thompson* has been recovered from the blood of a Polish soldier during an attack of malaria. There was no case history of food poisoning to explain why such an infection should develop and there were no indications of clinical signs or symptoms of disease referable to the alimentary tract. The high temperature recorded is of particular interest, but this is a recognized feature of *S. thompson* infections according to the opinion of Dr. W. M. Scott expressed in a personal communication. Other points of interest were the existence of a low leucocyte count of 6,100 per c.mm. although the fever was 105° F., thus suggesting a leucopenia and finally the apparent beneficial effect of sulphanilamide in controlling the fever.

#### ACKNOWLEDGMENTS.

I wish to thank Colonel J. M. Mackinnon for permission to forward this report for publication, also Major C. E. van Rooyen and the laboratory staff for their assistance.

---

### Current Literature.

---

ELKIN, D. C. Emergency Surgery of Heart. *Amer. J. Surgery.* 1939. Dec., v. 46, 551-61.

In discussing surgery of the heart it is of primary importance that the rôle of the pericardium should be considered. Within the confined space of this sac the heart beats, and if any fluid or pressure arises it is easy to understand that the action of the heart will be embarrassed. This pressure effect which is often referred to as "cardiac tamponade," may be produced by blood or effusion, and the symptoms vary considerably according to the rate of accumulation: 100 to 200 c.c. may readily cause marked ill-effects. As pressure on the heart increases the beat is damped down with a consequent fall in arterial pressure. On the other side of the circulation the venous

pressure rises in an attempt to maintain the cardiac output. Veins on the head and neck are engorged and some cyanosis becomes apparent, while the normal figure of 75 to 120 mm. water for venous pressure may reach 200 to 400. Heart sounds are scarcely audible and the pulse becomes very weak and rapid. Various degrees of tamponade may be met with, but in many cases the effect is so rapid that death occurs before any form of treatment can be considered.

When the heart is wounded death may result from hæmorrhage, but, unless there is a tear in the pericardium to let the blood escape, tamponade is an even more urgent feature. If the patient survives long enough to let surgery be considered, a general anæsthetic should be given and the pericardium opened. A transverse incision over the precordium is advocated and one or more ribs and costal cartilages resected. The internal mammary vessels are secured and the left pleural sac pushed to one side to expose the pericardium, which will probably be tense and bulging and of a bluish tinge. After incision, blood pours out of the sac and the heart beat becomes rapidly more forcible. After removal of blood the wound in the heart is sought for and active hæmorrhage controlled by gentle digital pressure while sutures are passed through the torn muscle edges. Fine silk stitches on eyeless needles are recommended, and these should be tied only just tight enough to approximate the torn surfaces. If tied too firmly, they cut through the friable muscle; another point is that they should include as much thickness of the muscle as is possible without injuring the endocardium. Immediate after-treatment will probably necessitate blood transfusion, oxygen and morphia. It has also to be borne in mind that other structures than the heart may have been injured, and damage to pleura and lung may also require attention.

Suppurative pericarditis is rarely a primary condition, and is one that is often overlooked in the course of other diseases. Diagnosis can be made certain only by aspiration of the pericardium—a procedure that is best performed from below and not from in front. The author, however, supports direct operative exposure of the pericardium. When the sac has been opened the edges are sutured to skin or muscle so as to keep the wound open, and irrigation as well as drainage is made possible by catheters passed to the back of the heart. Early operation is essential and should be carried out before there is too great an accumulation of fluid or before the pus becomes too thick. Without operation, and in the pyæmic forms, the chances of survival are practically nil, but in other forms surgery can save a reasonable proportion of cases.

The article also gives a short account of the surgery of pulmonary embolism and methods for resuscitation of the heart. In considering the rôle of cardiac massage the following points are worthy of emphasis:—the easiest route is through the abdomen with the hand passed over the liver, so that the heart can be squeezed through the diaphragm about 20 to 30 times a minute. Artificial respiration must be carried out at the same time, and the

chances of success depend on the interval between the actual arrest of the heart and the re-establishment, artificially or otherwise, of some form of circulation.

T. HOLMES SELLORS.

*Reprinted from "Bulletin of War Medicine." November, 1940.*

MINISTRY OF PENSIONS. **Handbook on Artificial Limbs and their Relation to Amputations.** 88 pp., with 42 figs. 1939. London: H.M. Stationery Office. [3s. 0d.]

This publication summarizes the experience and investigations of the Ministry of Pensions of over 42,000 cases of amputation from the Great War, in addition to more recent cases (averaging 850 yearly) which have been dealt with since 1921.

The book is divided into two parts, the first dealing with the lower extremity and the second with the upper. The section on the leg deals first with the surgery of amputations, including such points as the length of the stump, the final position of the scar and the treatment of the muscles and main nerves. The features of the ideal stump are enumerated and the deficiencies of the faulty pointed out. The investigations of the Ministry have shown in what respects stumps break down with time and how this can be minimized by careful surgery and limb-fitting. Then follow details of, and reasons for, fitting different types of limb to the various stumps.

The section on the upper extremity is dealt with in the same way. The ideal site for amputation is emphasized and the tendency to leave as much bone as possible, regardless of prosthetic considerations, is deprecated.

The comments on "common conditions affecting amputation stumps," together with the methods of prevention and treatment are valuable. There is a section on immediate after-treatment and the importance of rehabilitation is stressed. Much of the publication is devoted to mechanical details of more importance to the limb-fitter than to the surgeon.

Altogether, this is a most useful publication, embodying as it does a great wealth of experience over many years, and it should be read by the surgeon likely to treat patients requiring amputation for either traumatic or non-traumatic lesions.

RONALD FURLONG.

*Reprinted from "Bulletin of War Medicine." November, 1940.*

WALKER, K. M. **The Protection of the Soldier in Warfare.** *Proc. Roy. Soc. Med.* 1940, July, v. 33, No. 9, 607-11. (Sect. Surgery 29-33), 2 figs.

Walker relates his experiences in the last war, in which he found that there were large numbers of deaths due to small splinters of shell entering the front of the chest, which caused damage to the heart and roots of the great blood vessels. His experience was the same as that of the Germans, for Sauerbruch stated that of 300 dead examined on the battlefield, 37 per cent showed chest wounds. The splinters which cause the damage frequently have a very low penetrative power. A suggestion was made that

soldiers in exposed places should wear a steel breast plate which would cover the dangerous area and could also be fixed to a wooden handle to form an efficient entrenching tool. In the present war many soldiers are conveyed about by mechanical means and so the question of adding to the weight of equipment is not so important as it was in the last war. Again, there are varieties of steel which are much tougher than we had at our disposal in the last war. The author has devised a jerkin, to cover the whole of the chest and abdomen, which weighs only 14 pounds and which will stand up to projectiles of low or medium velocity (up to 1,200 feet per second), in other words, to shrapnel, hand grenades, revolver and automatic pistol bullets and to many shell and bomb fragments. It will resist a Tommy gun but not rifle and machine gun fire under a range of 1,000 yards.

In the discussion, Sir Richard Cruise described a visor he had invented to protect the eyes [see "*Bulletin of War Medicine*," 1940, September, No. 1, p. 24].

CHARLES PANSETT.

*Reprinted from "Bulletin of War Medicine," November, 1940.*

DEAN, D. M., THOMAS, A. R., & ALLISON, R. S. **Effects of High-Explosive Blast on the Lungs.** *Lancet.* 1940, August 24, 224-6, 5 figs.

A group of twenty-seven patients, who were under treatment for burns or other injuries resulting from the bursting of high-explosive bombs at close quarters, is reviewed. The authors stress the point that there was a disproportion between the frequency of the chest symptoms and the physical signs. It was not always easy to assess the relative importance of the chest injury as compared with the other wounds, and in this group only six patients complained of symptoms related to the chest, whereas there were definite physical signs in sixteen, and confirmatory X-ray abnormalities in fourteen of the patients.

The physical signs were: diminished movement of the diaphragm; fullness of the chest, giving it an emphysematous appearance; and impairment of resonance at one or both bases, with or without crepitations. It was usual to find the lower chest "blown up" or ballooned, especially in the region of the costal margin.

The radiological appearances in this group were those of a diminution of rib-expansion, together with slight loss of translucency on one or both sides. [To this may be added the X-ray appearances of atelectasis, since the condition is known to occur in injuries of the type under discussion.]

N. R. BARRETT.

*Reprinted from "Bulletin of War Medicine," November, 1940.*

FALLA, S. T. **Effect of Explosion-Blast on the Lungs. Report of a Case.** *Brit. Med. J.* 1940, Aug. 24, 255-6.

The chief interest in this paper is the report of the post-mortem examination which was performed upon a man aged 30 who was killed by the explosion of a bomb which fell close to him.



"A post-mortem was performed seven hours after death. The most striking changes were found in the lungs. They were, as a whole, not unduly congested. Many small fresh hæmorrhages were visible on the pleural surfaces everywhere. The cut surfaces of the lung were most striking, since innumerable bright red points of hæmorrhage were to be seen wherever a cut was made in either lung. The condition . . . may perhaps be described as a miliary condition of unmistakable fresh hæmorrhages . . . The trachea and bronchi showed a number of submucous points of hæmorrhage and there was some blood on the surface of the mucous membranes. No tear was found in any part of the lungs, and no injury was discovered in the brain, kidneys, spleen or other viscus. Microscopical examination showed generalized arterial dilatation and intense focal capillary dilatation, with exudate of fluid in many of the alveoli. In a few places there were red blood cells in the alveoli and in the small bronchioles."

N. R. BARRETT.

*Reprinted from "Bulletin of War Medicine," November, 1940.*

CATO, F. L., & NORMAN, W. D. **Traumatic Hæmothorax. An Analysis of 276 Cases.** *Surgery.* 1940, June, v. 7, No. 6, 848-59, 4 figs.

This paper deals with 276 cases of traumatic hæmothorax encountered amongst a total of 2,090 penetrating and non-penetrating chest wounds in patients who were admitted to the Charity Hospital of Louisiana, New Orleans, during the five-year period ending with 1936. Nearly all of these injuries were due to gunshot and stab wounds, and the patients were generally admitted to the hospital within twenty-four hours of the injury.

Although this paper is concerned with civil practice many of the observations are relevant to military injuries. The main differences between civil and military practice are that in the Great War it was estimated that about 25 per cent of hæmothorax cases became infected, whereas only about 10 per cent of civil cases develop an empyema, and that conservatism has been the keynote of civil injuries, whereas early operation is indicated in many war injuries.

The physical signs of hæmothorax are very variable, but on the affected side the usual findings are lagging, decreased vocal fremitus and resonance, dullness ranging to flatness, and decreased or absent breath sounds over the fluid, with skodaic phenomena above. The latter led to the diagnosis of hæmo-pneumothorax more often than it was actually present. The mediastinum may *not* be displaced away from the side of the hæmothorax for two reasons :

(i) The diaphragm on the affected side is very commonly elevated to such an extent that it appears to be paralysed. Boland [*Traumatic Surgery of the Lungs and Pleura, Ann. Surg.*, 1936, v. 104, 572] has suggested that this is due to a state of concussion of the phrenic nerve which is exposed to injury over a large part of its course across the pericardium.

(ii) There is atelectasis, which may be patchy, lobar, or total, in about

half the cases, and this tends to displace the mediastinum towards the affected side. The cause of this atelectasis is the same as in other conditions.

The mortality for the whole series is 25·4 per cent, but, if the patients who died within the first twenty-four hours are not included, the mortality is 8·7 per cent.

“Since hæmorrhage probably played the most important part in the early deaths, it would seem that this group of immediately fatal cases offers a field for investigation and salvage.”

The source of the blood in a hæmothorax is often difficult to determine ; but hæmorrhage which is resistant to conservative measures, and secondary hæmorrhage from the wound, are usually due to injury to the internal mammary or an intercostal artery. If the patient survives the first few hours, bleeding is most likely to be coming from small vessels in the lung, and conservative treatment is based upon the assumption that a reasonably slow accumulation of blood in the pleural cavity will stop, because the fluid will act as a tamponade and control the hæmorrhage. Bastianelli [“Treatment of Chest Wounds with special reference to artificial pneumothorax” ; *Surg. Gynec. & Obstet.*, 1919, v. 28, 5] and others recorded this fact and in consequence advocated immediate aspiration of blood from the pleural cavity and its replacement by air sufficient to maintain a positive intrapleural pressure.

Hæmothorax is frequently associated with serious visceral injuries, and in cases of this type the mortality is high.

Massive clotting of the blood in a hæmothorax is the exception, and occurs most commonly in infected cases. The usual state is that the blood in the pleural cavity, and the blood removed from it, fail to clot ; and, although some measure of clotting is probably always present, massive clot is prevented by churning movements of respiration which whip out the fibrin. [This explanation is not universally accepted.]

Indications for immediate operation include open sucking [or blowing] wounds, lacerations of the lung, large or contaminated foreign bodies in the thoracic cavity. Conservative treatment usually yields satisfactory results in patients who survive for twenty-four hours. Routine conservation is, however, unsafe and dangerous. Early complete aspiration and controlled positive pressure air-replacement seem based on sound physiological principles and deserve a more extensive trial in sterile cases. [The possible risk of air embolism is not considered.]

The paper includes a very good list of references, to papers published both during and after the last war, and to the modern literature on injuries to the chest.

N. R. BARRETT.

*Reprinted from “ Bulletin of War Medicine,” November, 1940.*

## Reviews.

---

**CASUALTY TRAINING, ORGANIZATION AND ADMINISTRATION OF CIVIL DEFENCE CASUALTY SERVICES.** By G. B. Shirlaw, L.R.C.P., L.R.C.S. Edin., L.R.F.P. and S.Glas. London: Secker and Warburg. 1940. Pp. XIX + 283. Price 8s. 6d. net.

This is an excellent book, and should be read by all military medical officers as well as those engaged in the A.R.P. Medical Services.

The author has learned much from his experiences in Spain, as well as from his work as an A.R.P. officer in London.

He has not hesitated to quote freely from the writings on Wound Shock, published in 1917. It is interesting to find confirmation of what was written so many years ago—but more emphasis might have been laid on the conception that “secondary wound shock is generally preventable.”

Full details of the Government scheme are given, which will be useful to whole-time officials.

The remarks on Classification, Sorting or “Triage” are all heartily endorsed. In dealing with mass casualties “classification not only becomes extremely difficult but becomes the most important step in the whole Casualty Service.” “This is repeated at every stage in the evacuation, but is of the greatest value in the early stages.”

The book is written in an easy and fluent style, is well printed and well illustrated with a useful bibliography.

Get the book, read it and practise its precepts.

E. M. C.

**J. F. SUTHERLAND'S FIRST AID TO INJURED AND SICK.** 42nd Edition. Revised and re-written by Halliday Sutherland, M.D. Pp. 77. Price 6d. net.

The amount of first-rate information crammed into this waistcoat-pocket size booklet is astonishing and is presented in a form especially useful in emergencies.

At the present time a knowledge of First Aid is essential to everyone and this brochure, so easily carried on the person, should be in everyone's pocket or handbag.

**THE SOLDIER'S FIRST AID.** By R. C. Wood. Toronto: The Macmillan Company of Canada, Ltd. 1940. Pp. xiv + 119. Price 2s. 6d.

This little book can be recommended for soldiers other than the R.A.M.C.

It is written clearly, and the chapters on bandaging and the transport of wounded are excellent.

It contains many unfortunate errors, which will be corrected in future editions no doubt, but these are not of a nature seriously to impair its usefulness to a non-technical corps. J. N.

THE PHYSIOLOGY OF SEX AND ITS SOCIAL IMPLICATIONS. By Kenneth Walker. Harmondsworth, Middlesex : Penguin Books, Ltd. 1940. Pp. xi + 157.

There can be little doubt that Sex and the multifarious problems associated with it are of far greater importance than the average layman realizes ; even though the subject is no longer taboo, as it was in the Victorian household, the ignorance of the general public is still remarkable ; even to-day few parents have either the courage or the knowledge to impart the necessary information to their children. For these and other reasons " The Physiology of Sex " is a little book which can be strongly recommended : to the churchman who has ever been ignorant of sex matters and unhelpful in solving our sex problems, to the lawyer who cannot distinguish between sex deviation and perversion, to parents and to adolescents.

The various considerations of the biology of sex, sex impulse, love, marriage, divorce and all the social problems involved are frankly and clearly discussed by Mr. Walker, whose reputation is a guarantee of the ability and fairness with which the subject is handled. T. E. O.

---

## Notices.

---

### THE FORGET-ME-NOT LEAGUE IN AID OF BRITISH PRISONERS OF WAR.

*Founder and Director :* MISS CHRISTINE KNOWLES, O.B.E.

*Chairman and Hon. Treasurer :* Lindsay Cutler, Esq.

*Vice-Chairman :* Mrs. Edward Collier (*Hon. Sec. Scottish Branch*).

*Headquarters :* Carrington House, Hertford Street, London, W.1.  
Tel. : *Mayfair* 0331.

---

THERE are many things that we take in our stride in our everyday life—soap, towels, tooth-brushes, etc., are as natural to us as the air we breathe, yet these things are the dire needs of our prisoners-of-war in enemy prison camps.

To how many a wife and mother does the making up of a suitable parcel present a real difficulty. There are official advice documents to be read and understood ; money has to be found to provide a new and expensive outfit for those who have lost all. It is here that the Forget-Me-Not League gives help and advice. Where poverty denies, the League provides a full

parcel ; where the parcel lacks, the League supplements by including those things that are necessary. Most important of all, the League does this with a human, personal care so that every parcel is an eloquent gift, linking prisoner with his home, his regiment or his friends.

You can become a member of the League by giving a donation of 1s. When you have collected 20s. you will have a Forget-me-not.

You can help in the following ways :—

Taking a Collecting Box ; Organizing Whist Drives, Concerts, Dances, etc., or Working Parties (for particulars of these parties, write to Miss Christine Knowles, *O.B.E.*, Carrington House, Hertford Street, W.1, marking your envelope “ Working Party ”).

### BRITISH PRISONERS OF WAR.

Carrington House, Hertford Street, London, W.1.

#### ADOPTION PARTICULARS.

The British Prisoners of War Books and Games Fund sends a 1st Capture Parcel consisting of Bible, Novel, Chess Set, and Pack of Playing Cards, to every man, be he Peer or Peasant, directly his name and full address reaches them. In addition he receives a parcel every month containing his especial choice.

His relatives and his regiment and unit are contacted, and every line is secured so that each prisoner can be studied as an individual and not only as a number.

The relatives or friends, or any kindly individual can *adopt* a prisoner for 5s. monthly : that is to say, on payment of 5s. monthly a parcel will go out, bearing the name of the donor. The donor, unless next-of-kin, will not receive letters, as necessarily the very limited correspondence will be reserved, as is only right, for their loved ones. The donor, however, may write occasional letters, on general matters, which cheer and comfort the men in their enforced exile. No reference to the war or anything political may be mentioned, and letters should be brief. The envelope should be addressed as follows :—

*On Front of Envelope :—*

PRISONER OF WAR POST  
KRIEGSGEFANGENENPOST

No. 543210 Pte. John Jones  
British Prisoner of War  
Camp No. 876  
Stalag II  
Germany.

*On Flap of Envelope :—*

From  
Mrs. John Jones  
29 Hope Terrace  
Peaceham  
Homeshire.

# JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

## Corps News.

FEBRUARY, 1941.

### EXTRACTS FROM THE "LONDON GAZETTE."

*Dec. 31.*—*Short Service Commission.*—  
The undermentioned to be Lt. (on prob.).  
*Dec. 19, 1940* :—

Joseph Esmond Miller (163133).

### Regular Army Reserve of Officers.

*Dec. 31.*—Capt. (actg. Maj.) E. J. Mannix,  
M.B. (15748), to be Bt. Maj. *Dec. 16, 1940*,  
under the provs. of Art. 168, Royal Warrant  
for Pay and Promotion, 1940.

*Jan. 10.*—The undermentioned cease to  
belong to the Res. of Off. on account of ill-  
health :—

Col. R. M. Dickson, *O.B.E.*, M.D. (9548).  
*Jan. 8, 1941.*

Maj. H. E. P. Yorke, *M.C.* (14492).  
*Jan. 9, 1941.*

### AWARDS.

#### MILITARY CROSS.

The *M.C.* has been awarded to Major  
Walter Dalglish Jackson and Lieuts. Ronald  
Rodger Gordon and Martin Turner Read,  
R.A.M.C., in recognition of gallantry in  
France and Flanders; and to Lieut. John  
Graham Lord, R.A.M.C., in recognition of  
gallant conduct in action with the enemy.

#### MENTIONS IN DESPATCHES.

The names of the following have been  
brought to notice in recognition of dis-  
tinguished services in connection with opera-  
tions in the field, March to June, 1940.

*Commands and Staff*: Major-General  
J. W. L. Scott, *D.S.O.*; Colonels R. Erring-  
ton, *C.B.E.*, *M.C.*, *T.D.*, C. L. Franklin, *M.C.*,  
A. Hood, *C.B.E.*, E. M. O'Neill, *D.S.O.*,  
A. C. Hammond Searle, *M.C.*, and S. G.  
Walker; Lieut.-Colonel (Acting Colonel) J.  
C. A. Dowse.

*Royal Army Medical Corps*: Lieut.-  
Colonels S. Arnott, *D.S.O.*, J. W. Hyatt,  
A. R. Barlas, J. H. Ward, *D.S.O.*, *M.C.*,  
C. H. K. Smith, *M.C.*, D. McVicker, *M.C.*,  
F. G. Flood, *M.C.*, A. Bremner, G. G.  
Drummond, W. A. Ramsay, T. Parr, R. E.  
Rees, *M.C.*, K. A. M. Tomorrow, and W. H.  
Marston; Majors (Acting Lieut.-Colonels)

L. C. Lade, J. H. Bayley, *M.C.*, and E. P. N.  
Creagh; Captains (Acting Lieut.-Colonels)  
C. R. Sadler and H. L. G. Hughes, *D.S.O.*,  
*M.C.*; Major (Temporary Lieut.-Colonel)  
W. M. Cameron, *O.B.E.*; Majors J. G.  
Black, J. A. Brocklebank, R. G. Evans,  
F. A. Donolly, W. E. Underwood, J. Houston,  
J. Boyle, G. Punshon, A. R. H. Champion,  
A. E. King, L. B. Stott, J. D. W. McCracken,  
H. F. Wattsford, Y. Moore, O. D. Jarvis,  
*O.B.E.*, D. A. O. Wilson, E. I. B. Harvey,  
A. D. Bourne, G. R. McNab, R. T. P. Tweedy,  
W. B. F. Orr (since deceased), A. D. Davidson,  
S. A. Maddocks, J. E. Morrison, St. C. E. J.  
Barrett, A. D. Briscoe, F. B. Mackenzie,  
*D.S.O.*, *M.C.*, and D. N. Nicholson; Captains  
(Acting Majors) J. H. J. Crosse and A. G.  
Whitfield; Lieuts. (Acting Majors) A. C.  
Stevenson and D. P. McCoy; Lieut. (Tem-  
porary Major) D. M. Jones; Captains F.  
Murray, W. G. Bateson, I. B. Pirie, O. M.  
Walker, W. H. Valentine, W. O'Callaghan,  
R. Rutherford, F. V. Allen, P. E. Cresswell,  
L. Evans, and F. J. Henderson-Begg;  
Lieuts. (Acting Captains) H. W. Beetham and  
J. A. Farrell; Lieuts. R. C. Little, D. I.  
McCallum, A. S. C. Hobson, J. W. Landells,  
J. W. Dowzer, P. K. Walker, R. Bevan,  
C. E. Stuart, J. P. Lane, J. G. Munro, F. R.  
Store, J. C. Taylor, P. Louis, K. D. Moynagh,  
D. H. Jones, C. Hope, W. H. Hylton, M. R.  
Grace, C. D. Preston, F. J. D. Webster, C. D.  
Anderson, J. A. Farfor, M. R. Joseph, G. H.  
Scoular, E. Cullen, A. T. Blair, R. MacKay,  
M. W. Paterson, G. S. Sheill, W. G. J.  
Gordon, J. H. Rose, N. C. Rodgers, J. J.  
Hogan, M. Herman, and L. H. Crosskey.

The names of the following have been  
brought to notice in recognition of dis-  
tinguished services in connection with opera-  
tions in Norway:

*Commands and Staff*: Colonels G. A.  
Blake and P. H. Mitchiner, *C.B.E.*, *T.D.*;  
Lieut.-Colonel (Acting Colonel) W. E. Tyndall,  
*M.C.*; Major (Acting Lieut.-Colonel) A. J.  
Beveridge, *O.B.E.*, *M.C.*; Captain (Acting  
Major) R. O. Brooks.

*Royal Army Medical Corps*: Captain  
(Temporary Major) J. Bruce; Lieuts. A. E.  
Loden and A. E. Burgess.

## QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

*Dec. 31.*—Sister Miss N. K. Durrant resigns her appt. Nov. 1, 1940.

The notifn. regarding Sister Miss J. E. Ransom, in the Gazette of Dec. 24, 1940, is cancelled.

*Jan. 3.*—Sister Miss M. L. F. E. Erskine-Shaw retires, receiving a gratuity. Nov. 16, 1940.

The undermentioned Sisters resign their appts. :—

Miss A. B. P. Smele.	Nov. 26, 1940.
Miss M. T. Thompson.	Nov. 29, 1940.
Miss L. H. Owen.	Dec. 4, 1940.
Miss Y. M. Douglas.	Dec. 19, 1940.
Miss L. M. Carter.	Dec. 22, 1940.

The undermentioned Staff Nurses to be Sisters :—

*Oct. 25, 1940 :—*

Miss M. P. Ransley (with seniority next below Miss E. M. Orrell).

*Nov. 14, 1940 :—*

Miss E. M. Stonham.  
Miss M. J. Baird.  
Miss J. C. J. Keir  
Miss L. C. Allan.  
Miss S. E. Toland.  
Miss J. Tozer.  
Miss E. M. Lloyd.

*Nov. 15, 1940 :—*

Miss I. E. Paddon.

*Nov. 16, 1940 :—*

Miss K. L. Brewin.

*Nov. 23, 1940 :—*

Miss J. S. Brooks.

*Nov. 27, 1940 :—*

Miss M. Hellen.

*Jan. 10.*—The undermentioned Sisters resign their appts. :—

Miss E. J. Howson.	Nov. 14, 1940.
Miss L. M. Thorpe.	Nov. 26, 1940.

Provl. Staff Nurse Miss S. P. C. Fletcher terminates her appt. Nov. 18, 1940.

## ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

THE activities of the Guild continue on the same lines as already described. During the past month parcels have been sent to many parts, including the Middle East.

Subscriptions continue to come in, and it is pleasing to record some new methods of collecting funds. In one Command, entertainments were organized, and as a result the Guild has received a cheque for £120. Col-

lections made in the Chapel of a Military Hospital on behalf of the Guild, amounted to £5. In one Branch of the War Office, a scheme for collecting small weekly subscriptions from the clerical and other staff, has given a sum up to the present of £25. The Committee are deeply grateful to all those responsible as well as to the other subscribers and workers.

## DEATHS.

**TURNER.**—In Camberley, on November 25, 1940, Lieutenant-Colonel William Turner, C.M.G., R.A.M.C., Retired. Born at Newhouse, February 25, 1859, he was educated at Edinburgh, where he was Demonstrator in Anatomy in the Medical School and House Surgeon of the Royal Infirmary and where he took the L.R.C.P. and S. in 1882. Commissioned Surgeon January 31, 1885, he was promoted Surgeon Major January 31, 1897, and Lieutenant-Colonel January 31, 1905. He retired February 25, 1914, but rejoined February 12, 1915, being relegated to unemployment on August 18, 1919. He served in Suakin in 1885, being awarded the Medal with Clasp and Bronze Star. He took part in the Isazai Expedition on the North West Frontier of India in 1892. He served in South Africa 1900-1902 in the operations in Cape Colony, Orange River Colony and Transvaal, being awarded the Queen's Medal with three Clasps and the King's Medal with two Clasps. In the

war of 1914-1918 he served first as A.D.M.S. of the Welch Division, Territorial Force, and afterwards at Aldershot. Thrice brought to notice for valuable services rendered in connection with the war he was awarded the C.M.G.; *London Gazette*, August 8, 1917.

**SPONG.**—On December 22, 1940, Lieutenant-Colonel William Arthur Spong. Born in Toxteth Park, Lancs., April 11, 1883, he was educated at Trinity College, Dublin, where he graduated M.B. in 1907. Commissioned Lieutenant R.A.M.C., July 29, 1907, he was promoted Captain January 29, 1911, Major July 29, 1919, and Lieutenant-Colonel October 19, 1931. He was Deputy Assistant Director General, War Office, January 29, 1926, till March 31, 1927. He retired September 3, 1935, but rejoined for duty on mobilization September 2, 1939, and was so serving at the time of his death. During the war of

1914–1918 he served in India and was brought to the notice of the Government of India, for valuable services rendered in connection with the war, in the list published September 21, 1918.

A correspondent writes :—

"The many friends of W. A. Spong will hear with deep regret of his sudden death on Dec. 22, 1940.

"He had spent many years of his Army service in India and when he retired from active service a few years ago he settled in a busy country practice in Wiltshire, returning to serve on the outbreak of war.

"He was always a hard worker, never sparing himself either in doing his job or in looking after the welfare and comfort of those under his care, whether patients or personnel.

"He was generous to a fault and it was his delight to know the christian names of each child in his practice, chatting to them all in easy fashion, whether they came from the labourer's cottage or the mansion.

"A keen shot and angler both at home and abroad, he was happiest when he was able to snatch a few hours respite to visit the banks of some river, full of anticipation and, more often than not, reluctantly coming away with very satisfactory results.

"Our heartfelt sympathy goes out to his widow and children in their great bereavement."

BUTLER.—On Dec. 29, 1940, in Hove, Colonel Sydney George Butler, *D.S.O.* Born in Walton, Lancs., he was educated at the London Hospital and took the M.R.C.S. and L.R.C.P., London, in 1907. Commissioned as Lieutenant R.A.M.C., July 27, 1899, he was promoted Lieutenant-Colonel March 1, 1915, and retired with rank of Colonel Nov. 9, 1920. In the South African Campaign of 1899–1902 he took part in the Relief of Ladysmith, including actions at Colenso, Spion Kop, and Vaal Kranz; operations on Tugela Heights February 14 to 27, 1900, and action at Pieters Hill; operations in Transvaal, including action at Frederickstad October 17 to 25, 1900; operations in Cape Colony including action at Ruidam. He received the Queen's Medal with five clasps and the King's Medal with two clasps. In 1914–1921 he served in France and Flanders in charge of No. 3 Stationary Hospital and No. 8 General Hospital. Later he was Consulting Surgeon to the Troops in France and Flanders, and then Consulting Surgeon, British Army on the Rhine. He was mentioned in despatches *London Gazette*, October 19, 1914, being awarded the *D.S.O.* for coolness and courage in continuing all day to collect wounded under severe shell fire at Missy on September 15, 1914, *London Gazette*, December 9, 1914; 1914 Star and Clasp, the British War and Victory Medals.



### EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc., which should be in duplicate if possible according to King's Regulations.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

**All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps," will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.**

A free issue of twenty-five reprints will be made to contributors of Original Communications and of twenty-five excerpts in the case of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, A.M.D.5, Hobart House, Grosvenor Place, S.W.1."

### MANAGER'S NOTICES.

The Annual Subscription for the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is £1 payable in advance. Single copies, 2s. 6d. per copy.

**Cheques, etc., should be made payable to the "Journal R.A.M.C.," and crossed "Holt & Co."**

Communications in regard to subscriptions, change of address, etc., should be addressed "THE MANAGER, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, A.M.D.2, Hobart House, Grosvenor Place, S.W.1."

### ADVERTISEMENTS.

*Communications regarding Advertisements should be addressed—*  
**G. STREET & CO., LTD., 8, SERLE STREET, LONDON, W.C.2.**

23  
BIOLOGY  
LIBRARY

No. 3.

March, 1941.

Vol. LXXVI.

# Journal

OF THE

## Royal Army Medical Corps

ISSUED MONTHLY



EDITOR

COLONEL S. LYLE CUMMINS, *C.B., C.M.G.*

ASSISTANT EDITOR

LIEUTENANT-COLONEL H. A. SANDIFORD, *M.C., R.A.M.C.*

MANAGER

LIEUTENANT-COLONEL W. J. F. CRAIG, *R.A.M.C.*

### CONTENTS

	PAGE		PAGE
ORIGINAL COMMUNICATIONS.		EDITORIAL.	
Notes on the Medical Services of a Division. By Colonel J. C. DOWSE, <i>M.C.</i>	127	Food: Use of Potato Flour	167
A Modification of the Method usually employed to obtain Specific Cultures from Salmonella Group Variants. By Major G. T. L. ARCHER, <i>R.A.M.C.</i>	143	CLINICAL AND OTHER NOTES.	
A Brief Survey of the Treatment of Fractures of the Leg and Foot. By Major E. A. SMYTH, <i>R.A.M.C.</i>	147	A Closed System of Water Disposal by Surface Evaporation. By Captain H. B. L. DIXON, <i>R.A.M.C.</i>	168
Streptococcal and Staphylococcal Fevers. By Captain DEREK LEVIS, <i>M.B., B.Chir.Cantab., R.A.M.C.</i>	153	A Portable Disinfector. By Major R. BENNETT, <i>R.A.M.C.</i>	171
Treatment of Gonorrhoea with M & B 693. By Major J. M. OFFICER, <i>R.A.M.C.</i>	163	A Case of Infection with <i>Fasciola Hepatica</i> . By Major G. W. B. SHAW, <i>R.A.M.C.</i> , and Captain A. J. CLYNE, <i>R.A.M.C.</i>	173
		The Doctor's Bag. By Major E. A. SMYTH, <i>R.A.M.C.</i>	174
		CURRENT LITERATURE	182
		REVIEWS	184

JOHN BALE & STAPLES LIMITED  
83-91 GREAT TITCHFIELD STREET LONDON W.1

Price Two Shillings and Sixpence net

DOCUMENTS DEPARTMENT  
OCT 20 1950  
LIBRARY  
UNIVERSITY OF CALIFORNIA

Digitized by Google



## LOCAL ANÆSTHESIA IN SURGICAL PRACTICE

Novocain has been in general use in all the chief Hospitals for over 20 years. Conclusive proof of its efficacy is now to be found in every standard work on Local Anæsthesia.

For every type of MAJOR AND MINOR SURGICAL OPERATION.

Hypodermic Tablets "A" for Minor Surgical Operations.

" " "B" for Block Anæsthesia.

" " "C" for Spinal Anæsthesia.

" " "E" for Dental Extractions.

Solutions in Cartridges, Ampoules and Stoppered or Rubber Capped Bottles.

*Does not come under the restrictions of the Dangerous Drugs Act.*

We invite applications  
for reports and details  
of major and minor operations with Novocain.

# NOVOCAIN

*Brand Ethecain  
Hydrochloride*

**The Original Preparation.**

English Trade Mark No. 276477 (1906).

As supplied to the R.A.M.C., War Office, Admiralty, Crown Agents for the Colonies, &c  
*Sold under Agreement*

**The SACCHARIN CORPORATION, Ltd., 72 Oxford St., London, W.1.**

Telegrams: "SACARINO, RATH., LONDON."

Telephone: MUSEUM 8096.

Australian Agents—J. L. BROWN & Co., 123, William Street, Melbourne, C.1.

*Please send a postcard or your professional card  
for a clinical sample, and explanatory literature of*

## "CURICONES" Anti-Rheumatic Capsules

**SUPPLIED TO OVER 6,050 DOCTORS**

*(Figures certified by Chartered Accountants)*

**STEPHEN MATTHEWS & CO., LTD.,**

*Manufacturing Chemists and Druggists,*

19/21, FARRINGDON STREET, LONDON, E.C.4.

# CHRISTOPHER & C<sup>O</sup>. LTD.

**WINE MERCHANTS,**

**43, PALL MALL, LONDON, S.W. 1**

**MILITARY MESSES SPECIALLY CATERED FOR.**

**FOR OVER 30 YEARS SUPPLIERS TO R.A.M.C. HEADQUARTERS MESS**

Telephone: WHITEHALL 5557/8.

When writing advertisers please mention "Journal of the R.A.M.C."

---

Authors are alone responsible for the statements  
made and the opinions expressed in their papers.

---

Journal  
of the  
Royal Army Medical Corps.

---

---

Original Communications.

---

NOTES ON THE MEDICAL SERVICES OF A DIVISION.

BY COLONEL J. C. DOWSE, M.C.

THE following notes have been compiled from the experiences gained on active service and practical exercises. They are the collected impressions of many medical officers, field ambulance commanders and others.

They do not pretend to answer all the questions that arise in dealing with the collection and evacuation of casualties from the forward area but, if any of the suggestions found in the notes help those who have to organize field medical units or work in these units, their object will have been attained.

Where at times the theories advanced seem to stray from accepted ideas, it can only be said that an all too short experience of the "real stuff" did not tend to show that these theories were impracticable. On the contrary, *experientia docet*, and that experience all points to the conclusion that rapidity of evacuation of the casualty is of major importance and further, that this can only be accomplished, in these days of mechanization, if the field medical units are given motor ambulance vehicles in much larger quantities than at present allowed in war establishments.

(1) *The Rôle of the Field Ambulance in Mobile Warfare.*

It may be taken as an axiomatic truth that a unit not essentially mobile by virtue of its war establishment transport, cannot become mobile under war conditions.

The construction of the field ambulances that went to France with the B.E.F. was not essentially mobile. It was not possible, without overloading the vehicles, to carry all the equipment and the personnel at one and the same time in the unit transport.

The field ambulances of the division to which I was attached did make several long "marches," and were able to make the journey in one trip, but the vehicles suffered and there was an undue proportion of mechanical breakdowns in consequence.

These breakdowns, caused almost entirely by the constant overloading of the vehicles, occurred before the war was many weeks old; one can easily imagine the state of the transport after six months or more of real mobile warfare.

The Unit Transport Officer is constantly faced with the problem of getting a bad mark from the Commanding Officer for refusing to let his vehicle carry more weight than that for which it was designed or for submitting to the inevitable and finding broken springs and over-heated engines in excessive quantities.

The Commanding Officer, on the other hand, while fully realizing that the Transport Officer is right, feels that he must get his personnel to the end of the journey in good time and in fresh condition, if they are to play their part in the evacuation of the wounded to the credit of their unit and their Corps.

I make bold to state that no soldier in the division requires to be fitter or fresher for his work than the stretcher bearer. He cannot carry loaded stretchers for long hours after a hot and sweaty march.

The suggestion that the field ambulance can make its trip in two bounds by sending back transport to pick up the "non-carried" personnel is, quite definitely, outside practical politics in actual warfare. An attempt to do this on two occasions meant that the unit concerned became completely immobile and was unable to get into position with the necessary gear and personnel for six hours in one case and eight in another.

The pernicious habit of carrying R.A.M.C. personnel in the motor ambulance cars should never be permitted. The ambulance cars must always be available for their proper function, particularly when the danger of air attack is likely to cause casualties on the line of march.

#### *The Water Cart Trailer.*

The water cart trailer is not a good piece of equipment for a field ambulance.

The trailers have to be pulled by the lorries of the unit, if the water cart trailer has to be filled from a water source at some distance from the location of the unit, as frequently happened on active service. One of two things had to occur—either the tractor lorry had to take the trailer, having been emptied of its load of personnel and equipment, or move fully loaded, fill the water trailer, and then come back to its location. In the first instance the lorry's contents were immobilized until the lorry returned and in the second the personnel and equipment were useless until their return. In either case a great loss of efficiency and time resulted.

Field ambulances should be equipped with the self-propelled water

cart. Under active conditions field ambulances use a great deal of water. The water trailers were in constant use.

Apart from these considerations any form of trailer is unsound in a mobile column otherwise composed of non-trailer vehicles. The trailer cannot be backed for any distance. Vehicles pulling trailers are very often the cause of a "hold up" on the line of march when they over-shoot their turnings. It is refreshing to hear the gunners on this subject; the answer to their problem is perhaps not quite so easy!

## (2) *Medical Arrangements on the Line of March.*

The constant possibility of air attack and casualties therefrom, combined with the necessity for rapid deployment on the conclusion of the march, has made it essential to modify the position of the field ambulance personnel in line of march.

The usual position for the field ambulance whilst *en route* with a brigade is in the rear of the brigade group. A brigade on the road may well stretch for 20 miles or more. The head of the column may reach the debussing point or the assembly area before the field ambulance has left its billet, a difference in time of possibly four hours. It follows, therefore, that some portion of the medical unit *must* be with the leading troops, so that, as they deploy and engage the enemy, there may be medical aid available at once. Further, whilst on the march, casualties may occur from bombing. Arrangements need to be made so that casualties of this nature may be dealt with immediately.

The following scheme is a suggestion to meet these altered conditions. It has the advantage of having been tried out in its main features in actual warfare and has shown that it is a workable proposition. Naturally, modifications will have to be made to meet particular conditions.

One company of the field ambulance should move in the rear of the leading battalion of the brigade group. This company will remain with the leading battalion until the debussing point or the assembly area is reached and it will then be available to open an A.D.S. immediately. In addition to the normal transport it will have two motor ambulance cars attached.

For every ten miles of a route to be covered, one field ambulance medical officer and two nursing orderlies with a small quantity of medical equipment, e.g. splints and shell dressings, together with the officer's car and one motor ambulance car, will also accompany the leading battalion. Shortage of M.O.s may make it necessary for an N.C.O. to be in charge of one or more of these posts.

This medical officer, or N.C.O., will fall out of the column when the ten mile stage is reached and form an aid post or collecting post. The position of the post or posts will be determined on the map *before* the march starts and will be noted in the brigade operation order for the march.

The medical officers or N.C.O.s detailed to form the aid posts on the route

should not be found from the company forming the advanced party, but from the remainder of the field ambulance.

The intention of these posts on the line of march is that at no time should the marching or bussing troops be further from an aid post than five miles. The R.M.O.s will show that they have a point in each ten mile section of the route to which cases can be sent or from which assistance can be obtained. The R.M.O. can attend to his casualties, hand them over to the aid post, and rejoin his unit with the minimum of delay.

In order that the scheme may work smoothly, it is essential that brigade staffs fully understand the idea and make the necessary provision in their march tables for the field ambulance detachments. The locations of the posts must be notified in the orders for the march.

The main body of the field ambulance can move in the rear of the column. The personnel of the aid posts can rejoin the main body as that unit passes them.

(3) *A Standing Order for Field Ambulances.*

On receipt of orders for a march, a field ambulance commander will send one motor ambulance car to each battalion and field regiment, R.A., in his brigade group. This ambulance car will accompany the unit to the end of the march and will then be returned to the field ambulance *at once*.

If the march is to end with the deployment of the troops and an attack on the enemy, one stretcher squad of four stretcher bearers will also be sent to each battalion and field regiment. These stretcher squads form the first link between the R.A.P. and the A.D.S.

NOTE.—It is suggested that every unit that carries a medical officer on its establishment should have one motor ambulance car (light type) on its permanent establishment, in addition to the medical officer's truck. The need of such a vehicle is constantly felt by R.M.O.s whether on active operations or under "peace" conditions.

(4) *The Evacuation of Casualties from a Rapidly Changing Front.*

As soon as the leading battalions debus and deploy, contact with the enemy may be very rapid. Casualties occur possibly before the field ambulance has had a chance to establish an A.D.S.

The R.M.O. can only collect his casualties and "dump" them until he is in contact with the field ambulance behind him.

The battalion may be making rapid moves forward with which it is well-nigh impossible for the R.M.O. to keep pace.

In all such moves the battalion commander must decide on the probable line of evacuation of his casualties, so that his M.O., having dealt with the initial casualties, may be able to move his R.A.P. forward in the general line of the advance and contact the casualties as he goes forward. This information should be given to company commanders so that they, in turn, know what rearward routes they should direct their casualties along. The company stretcher bearers should carry their stretcher cases towards this route, once again making dumps to facilitate the eventual evacuation of these cases.



In the meantime, the field ambulance will have been able to contact the R.M.O. and will have commenced, by means of car posts and the stretcher bearers, to empty the successive R.A.P. locations. In *some* instances it may be possible for the ambulance cars to collect from beyond an established R.A.P. *when the situation forward permits*. Close co-operation between the R.M.O. and the field ambulance bearer officer is always necessary. In theory, the field ambulance is responsible for emptying the R.A.P. only, but their main function is to clear the front of casualties by the most rapid and effective means.

Company commanders must assist in the evacuation of casualties by making use of any form of transport that is available—returning ammunition lorries, supply lorries, civil carts and lorries, etc.

Messages from brigade headquarters, battalions, R.M.O.s, etc., asking for assistance and the clearance of wounded, should always be addressed to the A.D.S. serving that particular bit of the front.

The message should be sent by prefixing the letters A.D.S. to the code name of the ambulance forming it. "G" say that it is very unlikely that any messages will be sent to the A.D.S. by wireless and that this prefix will not give information away to the enemy. It would be better if each field ambulance had its code name and that a second code name was given to each unit for the A.D.S.

The field ambulance in this type of rapid movement forward must have a very "fluid" A.D.S. It is in reality merely a car post where cases are collected. As a rule the field ambulance commander will have eight cars at his disposal. Of these eight he will have four working between the R.A.P.s and the A.D.S. and the remainder from the A.D.S. to the M.D.S.

The tendency should be for the A.D.S. to be pushed as far forward as possible, the intention being to reduce the distance from the A.D.S. to the R.A.P. The A.D.M.S. will have a few cars up his sleeve for emergency and may be able to reinforce an A.D.S. that is having a heavy time. As a rule one brigade will be in reserve and not using all the cars in the field ambulance with that brigade, these cars forming a divisional pool.

#### (5) *Evacuation of Casualties from the Front Line in Defensive Warfare.*

The modern idea of "defence in depth" has brought many problems in the method of evacuating casualties.

The "dispersal" principle has added to these problems.

The regimental medical officer now has to think of methods by which he can get casualties from a number of more or less isolated points back to his R.A.P. He must site his R.A.P. so that it will be as central to the battalion defence area as possible. At the same time he must remember that his R.A.P. should itself be a dispersed area, well hidden from air observation and avoiding any collection of individuals in one spot.

Two facts arise from these basic principles.

It has been proved that it is very difficult to remove casualties from



isolated defensive posts during the daytime. There are no communication trenches down which casualties can be carried.

By careful use of dead ground in the rear of some of the posts it was possible to get the more lightly wounded away during the day.

Definite plans must be made so that the occupants of the posts will know the line of evacuation for their wounded, whilst the regimental stretcher bearers need to be well trained in the routes that they will use at night to get their cases away. These routes should be well sign-boarded whenever possible.

The defensive posts should be equipped with a number of shell dressings, etc., so that the occupants can render first aid to their wounded whilst they await removal to the R.A.P.

The number of stretcher bearers in a unit rarely permits the possibility of staffing all the posts with stretcher bearers. It is one of the necessities of this type of warfare that the wounded must wait to be removed till a suitable opportunity presents itself. Unless they can make their own way back and/or the regimental stretcher bearers can reach them they must remain where they are. This implies that a much larger number of men per battalion require to have training in first aid. Modern warfare is surely becoming one of "robots" and not human beings! The companies should have their complement of stretcher bearers with them. The bearers should be distributed as the company commander thinks fit, the R.M.O. retaining a small portion so that he can reinforce the companies as he considers best.

#### *Reinforcements for Stretcher Bearers.*

These can be obtained :—

- (i) From the reserve that the R.M.O. should hold with him at the R.A.P.
- (ii) By utilizing prisoners of war.
- (iii) By arrangements with the commanding officer to have a certain number of men in the reserve company earmarked for this purpose.
- (iv) By men from the company itself. This is not a sound method; active "rifles" should not be employed to carry wounded back, as the company cannot afford to lose men in this fashion. Besides it opens up means of excuse for absence from the line.

At the same time it must be borne in mind that regimental stretcher bearers are there to carry stretchers; the general line of training must be that stretcher bearers must be prepared to bring the casualties back to selected points where the cars can reach them and not expect ambulance cars to come right up to the casualty.

The dispersal theory must not be carried to extremes. A medical officer, like any other individual, can only be in one place at one time, and that place is his R.A.P. "treatment zone."

The R.M.O. must therefore train his personnel so that they can arrange

the R.A.P. area layout without the necessity for his personal supervision of the reception, treatment and evacuation zones of the dispersed R.A.P. Naturally the original siting of these zones is his duty. Once sited, his place is in the treatment zones and his staff organize the intake and regulate the flow of cases to the treatment zone and from thence to the evacuation zone where they are taken over by the field ambulance personnel.

In this connection the regimental padre can be of immense help in assisting the M.O. in organizing the R.A.P., clerking the wounded, supervising evacuation, etc.

Casualties, once they reach the R.A.P., are the responsibility of the field ambulance for further evacuation.

Whether the casualties can be removed by daylight will depend on the tactical situation. In general, the R.A.P. will be sited in such a position that movement to the rear should be reasonably safe.

The enemy should not be given credit for more than ordinary powers of observation and, therefore, if the exit routes are free from directly observed machine gun and rifle fire, small parties of stretcher bearers can move backwards with their casualties until they reach a point to which it is possible to get an ambulance car, i.e. the first car relay post on the line of evacuation.

The main principle in this evacuation scheme is that the ambulance cars should be pushed up as near the R.A.P. as possible, consistent with reasonable safety to the motor vehicle. The more the carry can be reduced the better for the patient and the more the energies of the field ambulance stretcher bearers can be conserved. Full use will be made of the wheeled stretcher carriers. Day and night sites for the car posts may have to be chosen. It is often easy to bring a car quite close to the R.A.P. at night whilst it is impossible to do so by day.

When it is not possible to bring cars within a reasonable distance of the R.A.P. it is well for the field ambulance commanders to recognize the fact that they must have their bearer relay posts well organized, so that there is a constant change over of the bearers. A definite routine should be established to ensure that no squad is on duty for more than four to five hours without a period of rest and the chance to get food and sleep. When the men recognize that they have four hours of real hard work and then a period of rest they will be able to give of their best for the whole time that they are "on the job." In arranging these reliefs the squad that has been sent to the R.A.P. as the first link must not be forgotten; these men most often have the hardest time, with the longest and most difficult carry.

This change over of personnel applies equally to the R.A.S.C. drivers of the ambulance cars. Reliefs should be arranged for these drivers so that a man is not expected to drive at night after a long spell just before dusk. Night driving in the forward area is a great strain. A tired man will lose his way, ditch his machine and make other mistakes much more readily than if he comes to the job fresh and well fed.

There is sometimes a tendency to regard a motor ambulance car as a piece of mechanism that should be in perpetual motion and for the human element, with its limitations, to be overlooked.

The R.A.S.C. driver is a gallant fellow, willing to carry on till he drops with fatigue. It is the transport officer's job to see that he gets reasonable rest and food. *N.B.*—Don't forget to include the D.P.s in the list of reliefs. It is perhaps a pity that the war establishments do not carry a larger proportion of spare drivers and motor cyclists.

The casualty having reached the car post arrives at the A.D.S.

The siting of this medical post is usually done by the field ambulance commander in consultation with the brigade staff. In this matter the field ambulance commander is the expert and the adviser of the brigade commander. The A.D.S. must be sited to fit in with the tactical scheme of the brigade commander, but arbitrary locations should not be made by the brigade commander.

It often happens that a location suitable for an A.D.S. is also ideal for a battery gun emplacement. Both units require similar terrain and considerable tact is required on the part of the field ambulance commander when suggesting that he should be given a particular bit of the Brigade front in which to open his A.D.S. A working arrangement might be that, unless the tactical situation is such as to make it imperative for the gunners to have a particular location, whoever first makes the reconnaissance and claims the site might be permitted to take possession! The decision naturally lies with the brigade commander.

There was a tendency during the recent operations in Belgium and France to locate the A.D.S. too far back; this may have been accounted for by the fact that the divisional front was so "fluid" that to place the A.D.S. in reasonable reach of the R.A.P.s involved constant moves.

*With the present equipment* in normal fighting and certainly in defensive positions, the A.D.S. not to be lightly permitted to fall into enemy hands, should be as far forward as possible. It is difficult to fulfil this condition out of the range of field gunfire and yet perform the function of an A.D.S. in a satisfactory manner.

The main reason why the A.D.S. must get up as near the front as possible is that the field ambulance is equipped with but eight motor ambulance cars. It is difficult to maintain an adequate shuttle system in the forward car posts if the run from the R.A.P. to the A.D.S. is made longer than is absolutely necessary.

Given a larger number of ambulance cars it would be possible to increase the distance between these two posts and at the same time to maintain a rapid evacuation of the casualties.

This theory at once opens up the burning question of rapidity of evacuation. It is obvious that the speed of evacuation of casualties from one point to another will depend, directly, on the number of vehicles available to transport the cases. The faster a wounded man can be transported

from the moment he receives his injury to the time that he comes under adequate medical attention at a C.C.S. the better for him. Every stop that he has to make, once he is in a motor vehicle, reduces the "safety" period for his wound.

The ideal, therefore, is that he should be collected in a motor vehicle as near the R.A.P. as possible, taken to a medical post where rapid first aid can be given, and from there sent direct to the C.C.S., i.e. cutting out one of the present posts, either the A.D.S. or the M.D.S.

The ideal can only be attained if the number of ambulance cars in a division is considerably increased and the whole composition of the field ambulance modified to meet the altered conditions. An article on this question appeared in the June, 1939, number of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, under the title "Mechanization and the Modern Field Ambulance."

Under the present system and formation of a field ambulance, little can be done to arrive at this more satisfactory state of affairs, but the addition of more light cars and motor cycle carriers would go a long way towards increasing the speed of collection and evacuation.

There can be little doubt that the experience gained in the fighting across the "pond" demonstrated the fact that there are too many delays in getting a wounded man back to the C.C.S.

All that is required is that there should be but *one* "sorting" office in the divisional area where first aid can be given to the wounded man after he leaves the R.A.P.; whether this place is called an A.D.S. or an M.D.S. is quite immaterial. The casualty should not be moved in and out of two cars before he is sent on his final trip to the C.C.S.

This "heresy" requires the alteration in the formation of the field ambulance mentioned above and a certain amount of reorganization in the function and method of employment of other units, notably the M.A.C.; this unit will have to come right up to the field medical post where the small vehicles are unloaded, i.e. rather nearer the line than is the custom at present.

In short, the system of evacuation would be: numbers of small cars and motor-cycle carriers collecting cases from as near the R.A.P.s as possible by means of car relay posts; these light vehicles to carry directly back to an A.D.S. or M.D.S. (what is there in a name?) there to be unloaded and the casualties vetted to determine if they are fit to move on at once. If they are, they will be put into the larger cars and sent direct to the C.C.S.

#### (6) *Evacuation of Casualties from the Divisional Area.*

It is the responsibility of the M.A.C. to clear the casualties from the divisional area. This is usually the M.D.S.

The following method was tried out in France and seems to have a number of advantages:—

The O.C. M.A.C. on instructions from the D.D.M.S. Corps arranges that the M.D.S. has a number of cars stationed by it, say four to six.

The evacuation route to the C.C.S. is decided upon and along this route, at suitable intervals, M.A.C. car relay posts are established.

As a loaded ambulance car leaves the M.D.S. and passes the first relay post an empty car is sent to replace it ; this procedure is followed down the series of relay posts.

The car with the cases arrives at the C.C.S., delivers its load and joins the main pool of cars in the headquarters of the M.A.C. From this pool another car is sent to the first upward relay post and so the cycle commences again. The main advantage of having a shuttle system of this nature is that the driver, having arrived at the headquarters of his unit, can have some rest and food, fill up with petrol, etc., and be ready to take his turn again in the shuttle, or a spare driver can be put on the car. It should be rare for any one driver to have more than one or at most two long trips to do in the twenty-four hours. In addition, the supply of cars to the M.D.S. will be constant and at a rate that does not block the available space at the M.D.S. for hiding the vehicles. This is quite a point in this aerial type of warfare.

Once organized, the O.C. M.A.C. knows that he has cars reporting to the M.D.S. as they are required, thus doing away with the necessity of a constant stream of messages between the field ambulance and M.A.C.

The number of cars which form a "unit" in the shuttle system can be adjusted to meet the requirements of the situation within the capabilities of the M.A.C.

#### *(7) Equipment Carried in each Motor Ambulance Car.*

In addition to the normal equipment of stretchers, blankets, pillows and Thomas' splints, each ambulance car should carry one urinal, one bed pan, drinking mug and one bowl (a wounded man frequently vomits).

The M.T. dressing box is a useful adjunct. The compartment on the rear upper near side of the ambulance car is presumably intended to carry a bed pan and urinal but the inside container will not hold the normal model of bed pan as issued in the G 1098 equipment of a field ambulance. In any case, the bed pans and urinals at present held by the field ambulances do not permit of each ambulance car being equipped with these articles. Special indents must be submitted so that the eight cars can have their own equipment of this nature.

#### *(8) Maintenance of M.A.C. Cars and Personnel.*

Obviously this is the responsibility of the O.C. M.A.C. At the same time, in practice, several little points came to light that require definite attention. The feeding of the M.A.C. personnel who come to the M.D.S. frequently devolves on the field ambulance, as it is not possible for these men to get adequate food with their own unit until they arrive back at their

headquarters. This can usually be done as the field ambulance can get extra rations or a definite number of the M.A.C. personnel can be taken on the ration strength of the field ambulance.

Petrol and oil on the other hand is a different matter. Considerable care has to be taken to ensure that all the M.A.C. cars come *well* supplied with petrol and oil. It is hard for the quartermaster of the field ambulance and the unit transport officer to lay in a sufficient stock to meet more than their own requirements. Shortage in the M.A.C. cars very rarely occurred, but when it did, it was at very inopportune moments and was probably due to the fact that, in the retreat, the M.A.C. cars were a long way from their headquarters and from any means of replenishment.

(9) *Liaison.*

The immense importance of maintaining efficient liaison between the Medical Services and other branches of the Army cannot be too much stressed.

It is accepted that the Medical Services are largely an "A" concern. The A.D.M.S. deals almost exclusively with that branch. It is too often forgotten that when fighting commences the "forward" work of the field ambulances becomes of "G" interest to that officer.

The position of the A.D.M.S. is somewhat peculiar. He is not only the medical administrative officer for the division, but he is also commander of the R.A.M.C. units in the division.

It is just as important for the A.D.M.S. to know the tactical situation as it is for a brigade commander or a battalion commander, so that he may be in a position to make his dispositions to fit in with the tactical scheme. Immediate information of this nature can best be supplied by "G" staff.

Accurate and early news of the changes in the tactical situation is a *sine qua non* for efficient evacuation of casualties from the forward area.

This principle maintains from divisional headquarters to the battalion itself.

To put this principle into practice, battalion commanders, brigade commanders and the divisional staff should be constantly reminded of the necessity of maintaining liaison between themselves and the Medical Services.

Nobody realizes more than the medical liaison officer that a busy G.I. or brigade major may have little time to spare to give him all the information that he would like, but if the liaison officer is automatically included in all "G" conferences during active operations the necessity for constant "botherings" for information will largely disappear.

To elaborate a little more. The R.M.O. being the first link in the chain of the Medical Services must maintain constant touch with his battalion commander. It is also "up to" the battalion commander to see that his medical officer is informed of any change in the tactical situation as it affects the battalion. On several occasions, for instance, in the recent fighting

in France and Belgium, battalion headquarters moved to a new location. when, much to the surprise of the medical officer, he found that he had lost touch as he had not been told of the move.

This type of situation could be avoided if it were a regimental custom for the medical officer to have a runner, permanently posted to battalion headquarters, with no other duty than to carry messages between the battalion commander and his medical officer. This would form the first link in the liaison chain.

Passing to the field ambulance, one finds that the same situation is likely to occur.

Practically the only source of reliable information that the officer in charge of the A.D.S. can tap is to be found at the brigade headquarters. Here he will get news of changes on the brigade front, that this or that battalion is having a bad time, that casualties are greater on this flank or that, etc.

In order that this information may reach the field ambulance in time to be of use it is necessary for one of the field ambulance officers to be attached to the brigade headquarters, there to act as liaison officer. This may sound a waste of an officer, but in practice it is not so, as this officer can supply such a quantity of useful information that he fulfils an important duty if he does nothing else at all. The dental officer, who can do but little dental work in active operations, may make a very good liaison officer.

On the occasions on which communications broke down it was found that this principle of having a liaison officer constantly with the brigade had not been put into practice. In a war of movement this liaison must be closer than when static warfare is the order of the day.

The liaison link moves backwards to the divisional headquarters. Here one finds the A.D.M.S. on friendly terms with the A. and Q., getting information from him as to the administrative side of the division. Administration in times of "peace" forms the greater part of the work of the A.D.M.S.

One day comes the news that the division is to get on with the job of fighting. It is then that the A.D.M.S. has to divide his office into two parts, one to continue the administration and the other to tackle the "G" problems which now commence to assert themselves.

During times of "peace," "M" branch has little to do with "G," but the moment operations start the "G" side looms large on the medical horizon. Immediate information is required as to what the divisional commander intends to do. The A.D.M.S. must, therefore, be present at the "G" Conference. His D.A.D.M.S. represents him at the A. & Q. table.

It is on the result of this "G" conference that the A.D.M.S. is able to formulate his plans for the disposition of the medical units. Sometimes the conference is the preliminary one held by the commander himself. Here again it is essential for the A.D.M.S. to be present as the commander will want to know the main scheme of the medical arrangement, for nowadays

the medical picture rightly occupies a prominent place in the tactical schemes of any formation.

The A.D.M.S. finds out from the conference the estimated casualties, where these casualties may be likely to occur, which brigade will bear the brunt of the initial fighting, which is to be in reserve, the routes that the division is to take on advancing into battle and all the hundred and one items that go to form the information that the divisional commander is issuing to his brigades.

This information is required as soon as it is issued. The A.D.M.S. cannot afford to wait, as in former times, until he gets it second hand from A. & Q. Orders have to be issued to the field ambulances by the A.D.M.S. in both his capacities, i.e. administrative and as commanding officer. The field ambulances are divisional troops. Various moves may have to be made so that the medical arrangements fit in with the general tactical scheme. Perhaps No. 1 brigade is to be in reserve, but No. 1 field ambulance is required to take part in the evacuation of casualties from the forward area. This may necessitate a move out of the brigade area in which No. 1 field ambulance, for the moment, is billeted.

As a general rule, as soon as the A.D.M.S. has got the essential details of the proposed "G" plan he will hold a conference with his field ambulance commanders or representatives from these units. At this conference he will give the field ambulance representatives a pre-picture of the situation and outline the part that they are to play so that their units can get ready to act at once, before the actual operation orders are issued; the information thus given should be considered as an order but in every case it will be followed by the orders in writing.

At the same time the A.D.M.S. in consultation with the A. & Q. staff will draft the paragraph for inclusion in the divisional administration instructions. This paragraph includes locations of the medical posts, orders for the disposal of the field ambulances as far as those orders concern the brigade commanders, i.e. whether the field ambulances are under brigade command, etc. The R.A.M.C. operation orders are instructions for the field ambulances and other medical units and are sent to the brigades for information only. The divisional staff alone can issue *orders* to the brigade commanders.

At this point it may be well to stress the point that a field ambulance bearing the same number as a brigade does *not belong* to the brigade, and may frequently have to work with one or other of differently numbered brigades. In other words, whilst more often than not the field ambulance is brigaded for ease of administration, it essentially comes under the heading of "Divisional Troops," and unless definitely handed over to the brigade, takes its orders from the divisional headquarters.

It follows, therefore, that the A.D.M.S. must be included in the list of officers on divisional headquarters who join the divisional commander in the advanced or battle headquarters. It is only by this arrangement that



adequate and rapid information can be sent to the field ambulances as to the part that they are to play in the divisional operations, and the A.D.M.S. enabled to keep in touch with the kaleidoscopic changes of the situation in a war of movement.

It is very difficult for the "M" branch to carry out its duties if it is broken up. Therefore, the whole of the "M" branch must be included in the advanced headquarters. The D.A.D.M.S. is of no use if he is relegated to rear headquarters; all his work is connected with the troops in the forward area, apart from the routine office work that he has to perform. He is in any case the medical officer for divisional headquarters, and if the majority of the headquarters moves to the forward area, the D.A.D.M.S. should be with them, with the medical equipment.

By these means the final link in the liaison chain will be forged.

#### (10) *Intercommunication.*

Much as the field ambulance commander may loathe the idea, it is essential that one of the precious five motor cycles must be sent to the A.D.M.S. office. The divisional signals have more than they can manage, and it is but rarely that one can get a special D.R. to send to the field ambulances with any particular message. Messages sent by the D.R.L.S. arrive, but delay is the price that has to be paid in active operations. It is, therefore, much safer and quicker for the "M" branch to maintain its own system of intercommunication.

As an aid to intercommunication and the reception of messages all field medical posts should be well signboarded. In each field ambulance one or more men should be detailed for this duty and it should be their responsibility to place the signboards *and*, when the unit moves, to collect them again. It was found that the former was often quite well done, but when the unit moved the signs were left *in situ*, so that when they were required again new ones had to be made or important crossings were missed out.

Whenever possible the Provost Company should be amongst the first to get information of the exact locations of the various car posts, etc.

#### (11) *Training of Field Ambulances and Regimental Medical Personnel.*

It is not intended that a complete system of training should find expression in these notes, but some points of importance might be stressed.

The dispersal theory of modern warfare demands that the N.C.O.s of the units should be well practised in using their own initiative and should be taken into the confidence of their officers to a large degree. N.C.O.s will frequently find themselves in situations that make it difficult or impossible for them to get advice from their officers and they will have to act rapidly and make decisions affecting the personnel under their immediate control. It is, therefore, essential that they should be thoroughly conversant with the tactical situation and have a good knowledge of what

duties the unit has to perform. This requires a high grade of training in map reading, the tactical use of the field ambulance, the methods and means for the evacuation of casualties. They should be given opportunities to practise the handling of the various sections of the unit, to make reconnaissances, site car posts and act as "bearer" officers.

There is a tendency to assume that an officer must "make all the running" when plans are being made for some operation, but the advice from men who have had to do a good deal of the actual working of the schemes is frequently very valuable. Whilst the N.C.O.s of the unit should be able to look up to their officer and feel that in his hands they are being given a fair deal, at the same time the unit will be very much more efficient if it can boast of a collection of N.C.O.s so well trained in the duties of a field ambulance in actual war that, even if the officers are not available, the work will carry on with equal efficiency. To reach this standard the N.C.O.s must be given a chance to take practical charge of the various branches of the work and must not depend entirely on theory. The N.C.O.s must be allowed to take charge on field days and exercises; the officers might on these occasions act as umpires and, whilst holding a watching brief, make sure that the "learner" is really having a chance to take control and give orders, correcting errors where necessary but not interfering unduly. In this way self confidence is engendered and the N.C.O. is taught to take a pride in the way he does the work entrusted to him.

It is not always easy to find replacements for N.C.O.s who have been knocked out and the only way in which this can be done is to encourage the same principle amongst the private soldiers and the junior N.C.O.s. Under stress and strain many a man who has not shown up before demonstrates the fact that he has the qualities that are necessary for a good N.C.O.

In "peace" time he has little chance of bringing out these qualities, but, by making the men take an active part in the actual working of the schemes, by giving them jobs that require intelligent anticipation, unsuspected talent may be found. It is always a good thing to encourage the art of leadership.

Medical officers of battalions have a heavier task before them under modern war conditions. It is essential that they train a large number of men in their unit in first aid. It is not enough to say, "I have given my stretcher bearers several courses of instruction." This instruction must extend to as many men in the unit as can be managed when all the other forms of specialized training are taken into consideration. The dispersal of the unit in isolated defensive or offensive posts means that casualties will be hard to collect, and that the individual will have to depend on his comrades when he gets wounded, until an opportunity is available for his removal to the R.A.P. Whilst a little knowledge may be a dangerous thing, even a little may be the means of saving a valuable life.

Every use should be made of the Field Hygiene Section. Courses of instruction should be arranged through "G" for the personnel of the

fighting units in military hygiene, not merely classes for potential sanitary squad personnel. When a divisional school is in being the O.C. Field Hygiene Section can be very useful in giving the junior commanders class a " whip up " in sanitation and general hygiene.

Lastly, but by no means last in importance, is the question of the closest co-operation between the Army medical authorities and the civil administration for first aid and disposal of casualties in this country.

There is no distinction between a military and a civil casualty. The whole country is at present in the front line; mutual co-operation and understanding will greatly assist both sides.

All R.M.O.s and field ambulance commanders should make sure that they have accurate information of the locations of the civil aid posts and hospitals in their area and it is the duty of the Army medical authorities to keep their civil counterparts well informed of the locations of the military medical units.

---

## A MODIFICATION OF THE METHOD USUALLY EMPLOYED TO OBTAIN SPECIFIC CULTURES FROM SALMONELLA GROUP VARIANTS.

BY MAJOR G. T. L. ARCHER,  
*Royal Army Medical Corps.*

THE discovery of diphasic variation by Andrewes (1922) suggested the possible existence of three types of motile members of the *Salmonella* group, namely, diphasic organisms, organisms monophasic in the specific phase, and organisms monophasic in the group phase and, until recently, examples of all such types were recognized. Later investigations, however (Kristensen and Bojlen (1936), Edwards (1936), Kauffman (1937), Archer (1938)), have shown that all those organisms which up to the present have been described as monophasic in the group phase are not so in fact, since the specific phase can be obtained from them by appropriate methods, and no such organism finds a place in the Kauffman-White scheme as recently amended by Kauffman.

The object of this communication is to describe a modification of the usual method of growth in the presence of group serum, as described by Scott (1926), for obtaining specific suspensions from group phase cultures; and to confirm by its use the discoveries by Kauffman and Edwards of specific phases of *Bact. thompson* var. *berlin*, and *Bact. newport* var. *puerto-rico*.

### DISCUSSION.

When an organism in the group phase is submitted to the action of group serum in a fluid culture medium three types of response are theoretically possible.

(1) There may be no change in the antigenic structure of the organisms, so that all are agglutinated as they grow, forming a deposit at the bottom of the tube.

(2) Organisms in the specific phase may be produced and grow in the broth unaffected by the group serum present.

(3) A non-motile "O" variant may arise if the "O" antibodies present in the group serum used are heterologous to the "O" antigens of the organism under investigation, which appears to be almost essential to avoid S→R variation. This "O" variant, like the specific variant, will grow unaffected by the group serum present.

This third possibility is one which, in fact, commonly occurs and so prevents the successful use of Scott's method.

*The Modification.*—The modification to be described was devised to diminish the liability to "O" variation referred to above and combines the use of the "soft agar" technique for inducing or enhancing motility described by Colquhoun and Kirkpatrick (1932) with that of culture in

group-serum broth, thus bringing highly motile organisms continuously under the influence of group serum.

Three methods of applying this principle have been tried and are described below. The first has given the most satisfactory results.

*First Method.*—A sterile “U” tube is filled to about one-third of the height of the side limb with soft agar. The agar is of such consistency that if allowed to set in a 12-ounce bottle, it readily disintegrates on shaking (approximately 0.6 per cent). When the agar has set in the “U” tube one limb is filled with sterile group-serum-broth which displaces the agar towards the other limb until the levels are equalized. Inoculation is carried out by breaking the upper surface of the agar with a loop charged with the organisms under investigation. By the time organisms reach the broth after passing through the column of soft agar they should be highly motile and in a condition very favourable for variation of the flagellar antigens rather than H→O variation.

Success has attended the use of this method in certain cases where Scott's method alone has failed. Unexpected failures, however, have also occurred. Two technical defects have probably accounted for most of these: (1) fissuring of the agar; or (2) passage of broth between the side of the tube and the agar as the levels are equalized. Both these accidents are incidental to the lack of special apparatus and the consequent inevitable movement of the agar after setting. The preparation of a special “U” tube with one clear and one ground glass limb joined by a tap should prevent their occurrence.

*Second Method.*—Plates of soft agar, similar to that already described, but with the addition of group-serum-broth, are poured. These are inoculated by breaking the surface at the centre of the plate with a charged loop.

If spreading growth occurs subcultures are made from its edge, or the agar is broken up, saline is added, and the whole filtered through filter paper.

This method is based upon the assumption that motility, and consequent spread, are only likely to occur if the organisms are inagglutinable by the serum present.

*Third Method.*—This consists of the alternate use of soft agar with or without group serum, and group-serum-broth.

#### PRODUCTION OF SPECIFIC CULTURES FROM *Bact. thompson* VAR. *berlin* AND *Bact. newport* VAR. *puerto-rico*.

Utilizing the above modification of Scott's technique, specific cultures of *Bact. thompson* and *Bact. newport* have been obtained from their respective group variants, *Bact. thompson* var. *berlin* and *Bact. newport* var. *puerto-rico*.

(a) *Bact. thompson* var. *berlin*.—The culture used was received from the Lister Institute (N.C.T.C.).

An early subculture showed “O” variation; subculture to *Bact. stanley* (group), serum-broth also produced an “O” suspension (“culture O”), and continued work with this strain showed that it possesses

a marked tendency to "O" variation though other subcultures from the original culture received proved to be motile and "group" (or mixed) antigenically.

Soft agar in a "U" tube, the other limb of which contained *Bact. stanley* (group) serum-broth, was inoculated from the original slope received. After incubation the supernatant portion of the broth was found to contain motile specific *Bact. thompson* ("culture P").

A subculture from "culture P" to broth lost its motility and specific "H" agglutinability ("culture P1"), but the supernatant portion of a subculture of "culture P" in *Bact. stanley* (group) serum-broth showed a few motile organisms and specific "H" agglutination ("culture P2"), and a soft agar plate also inoculated from "culture P" similarly produced a specific *Bact. thompson* suspension ("culture P3") when broken up with saline after incubation and then filtered.

Two other cultures in soft agar inoculated from colonies on a plate subculture from the original culture received only gave rise to the production of the "O" variant when subcultured in *Bact. stanley* (group) serum-broth ("culture R" and "culture S").

These results are summarized in Table 1.

TABLE I.

*Abbreviations.* The following abbreviations are used for the sake of brevity in this table and subsequently.

Name of organism, etc.	Abbreviation.
<i>Bact. thompson</i> var. <i>berlin</i> .. .. .	Berlin.
<i>Bact. newport</i> var. <i>puerto-rico</i> .. .. .	N.P.R.
<i>Bact. cholerae</i> suis var. <i>kunzendorf</i> .. .. .	Kunzendorf.
<i>Bact. typhi</i> murium var. <i>binns</i> .. .. .	Binns.
A "U" tube of soft agar and nutrient broth .. .. .	U.
" " " " " and Binns serum-broth .. .. .	UB.
" " " " " and <i>Bact. stanley</i> (group) serum-broth .. .. .	US.
Binns serum broth .. .. .	B.
<i>Bact. stanley</i> (group) serum-broth .. .. .	S.
Soft agar .. .. .	SA.
Filtrate from a soft agar culture broken up in saline.. .. .	SAF.

SUSPENSION.	METHOD OF PREPARATION.	SERUM.	
		<i>Bact. thompson</i>	Kunzendorf.
		(specific).	
<i>Bact. thompson</i> (specific)	—	1/20,000	0
Kunzendorf	—	1/50	1/5,000
Berlin "culture O"	Culture on <i>Bact. stanley</i> (group) serum-broth.	<1/500	
" " culture P"	US	1/20,000	1/25*
" " culture P1"	US subcultured in broth	<1/500	1/25*
" " culture P2"	US → S	1/20,000	0
" " culture P3"	US → SAF	1/20,000	0
" " culture R"	SA → S	<1/500	0*
" " culture S"	SA → S	<1/500	0*

<1/500 = less than 1/500, i.e. no agglutination at 1/500 or higher dilutions.

\* Result after two hours all showed agglutination of a somatic type to 1/250 or more after standing at room temperature overnight.

Thus specific *Bact. thompson* suspensions were obtained from *Bact. thompson* var. *berlin* by a combined use of soft agar and group serum-broth.

(b) *Bact. newport* var. *puerto-rico*.—The culture used was received from the Lister Institute (N.C.T.C.).

The results of the tests carried out, which are similar to those obtained with *berlin*, are shown in Table II together with the results of titration of a serum prepared against this variant. The latter demonstrate the presence of recessive specific agglutinogens in the group inoculum used for immunizing the rabbit.

TABLE II.

SUSPENSIONS.	METHOD OF PREPARATION.	SERUMS.			N.P.R.
		Newport (fresh)	Newport (stock)	Kunzen- dorf.	
<i>Bact. newport</i>	Standard agglutinable sus- pension R.A.M. College.	1/500 †	1/100 †		1/250 †
<i>Bact. newport</i>	Grown in <i>Bact. stanley</i> (group) serum-broth.	1/5,000 †	1/500 †	0	
<i>Bact. newport</i>	Grown in soft agar and subcultured to broth.	1/1,000 †		0	1/1,000 tr.†
<i>Bact. morbificans</i> bovis (group)		0			
Binns		0			1/5,000
<i>Bact. stanley</i> (group)		0			1/5,000
<i>Bact. newport</i> (group)		1/125 tr.		1/250	1/10,000
<i>Bact. newport</i> "O"		1/250	1/25		
N.P.R.	SAF		1/50 *	1/500	
"	Broth		1/50	1/500	
"	US	1/125 *	1/50 tr. *	< 1/500	
"	US→B		< 1/50	< 1/500	
"	US→S	1/125 *	1/50 tr.	< 1/500	
"	US→S.B.B.→UB	1/5,000	1/500		
"	US→S.S.S.→US	1/5,000	1/500	0	
"	UB	< 1/1,000		0	
"	U→SAF	< 1/1,000		0	
"	UB plated, 8 colonies to broth of these "Broth 2"	1/2,500	1/500	0	

Newport (fresh) is a recently prepared serum.

Newport (stock) is a standard agglutinating serum prepared at the R.A.M. College.

\* Granular, ? "O"

† Variation possibly due to quantitative variation in antigens "e" and "h."

I was not successful in attempts to demonstrate the specific antigen "C" in *Bact. typhi suis* var. *voldagsen*. Kauffman, however, has informed me that he has succeeded in demonstrating the specific phase of this variant.

#### CONCLUSION.

The work of Kauffman and Edwards which demonstrated the presence of specific antigens in *Bact. thompson* var. *berlin* and *Bact. newport* var. *puerto-rico* is thus confirmed. The value of the combined use of soft agar and serum-broth as a means of obtaining specific phase cultures from apparently pure group phase organisms, by preventing the development of the "O" variant otherwise so liable to occur, is demonstrated.

#### REFERENCES.

- ARCHER, G. T. L. (1938). *Journal of the Royal Army Medical Corps*, **71**, 4, 235.  
 COLQUHOUN and KIRKPATRICK (1932). *Journ. Path. and Bact.*, **35**, 3, 367.  
 EDWARDS, P. R. (1936). *Journ. Hyg.*, **36**, 348.  
 KAUFFMAN, F. (1937). *Z. Hyg.*, **120**, 177.  
 KRISTENSEN, M., and BOJLEN, K. (1936). *Zbl. Bakter.*, **136**, 294.  
 SCOTT, W. M. (1926). *Journ. Hyg.*, **25**, 398.

## A BRIEF SURVEY OF THE TREATMENT OF FRACTURES OF THE LEG AND FOOT.<sup>1</sup>

BY MAJOR E. A. SMYTH,  
*Royal Army Medical Corps*

IN this communication I wish to discuss the treatment of fractures based chiefly on Böhler's methods, with modifications suggested by others, and a small personal experience added. I shall commence by discussing closed fractures of the leg from above, downwards.

### 1.—*Fractures of the Spine (Intercondylar Eminence) of the Tibia.*

There will nearly always be a large effusion of blood into the knee-joint. The treatment will depend on (a) whether practically no displacement exists allowing full extension of the joint, or (b) gross displacement, preventing full extension of the joint.

In the case of (a) a firm bandage is applied over the joint to limit further effusion and swelling, and the limb immobilized on a back splint (such as Cramer's) from the toes to the hip. At the end of four days the joint is aspirated and bandage and splint re-applied. After a further three days, if there be no recurrence of effusion and swelling has subsided, Unna's paste dressing is applied from the toes to the tibial tuberosity. The next day a plaster of Paris cast is applied over the Unna's paste from just above the malleolus to the hip-joint. The following day, the patient is allowed up, walking. By using Unna's paste under the plaster of Paris, good movements of the ankle are maintained. The cast is kept on for seven to eight weeks, at the end of which it can be dispensed with if X-rays are satisfactory. The fracture should be X-rayed through the plaster cast every three weeks.

In the case of (b), if marked displacement be present, it will be impossible to extend the knee-joint. Therefore, before even a satisfactory X-ray can be taken, the knee-joint will usually have to be aspirated and manipulated until full extension is obtained. This manipulation alone will nearly always cause a satisfactory reduction of the displaced fragment. Having achieved a satisfactory reduction, a firm bandage is applied to the joint and a back splint from the toes to the hip for seven days. At the end of this period, if there is no recurrence of effusion, and swelling has subsided, immobilization in Unna's paste and plaster of Paris is carried out as in the case of (a).

Three or four months after the accident, movements of the knee-joint will usually be limited by adhesions. These can be easily broken down under nitrous oxide or evipan anaesthesia. This procedure should be carried out gradually by slight manipulation once weekly, followed by normal

<sup>1</sup> Read before the Shanghai Medical Society, March, 1940.



walking. The final results are usually satisfactory. In rare cases where displacement cannot be reduced sufficiently to allow of full extension of the joint, and in old untreated cases, the displaced fragment must be removed by open operation through an incision in the same way as for removal of a cartilage.

## 2.—*Fractures of the Condyles of the Tibia.*

In these fractures, there is nearly always an involvement of the articular surface of the knee-joint, with a large effusion of blood into the joint. There may be (a) a fracture of one condyle with no displacement; (b) a fracture of one condyle with displacement; or (c) a fracture of both condyles which is practically always accompanied by gross displacement.

In (a), treatment is carried out as in the case of fractures of the spine the tibia, without displacement. The tibia is slightly adducted on the femur during application of the plaster case when there is fracture of the lateral condyle, and abducted in cases of fracture of medial condyle. By this means, the fractured condyle tends to be maintained in correct position by the pull of the collateral ligament which is usually intact.

In (b) treatment as in (a) for the first four days when aspiration is carried out. Combined with the aspiration the displaced fragment is levered into correct position by means of a Steinmann's pin, inserted immediately below the displaced fragment. The displacement of the fragments having been reduced they are compressed with a heavy clamp. Having obtained satisfactory reduction, a firm bandage and back splint are applied and maintained for another ten days. If X-rays show the position to be still satisfactory, the limb is immobilized in plaster cast from the toes to the hip with Böhler's walking iron incorporated. No Unna's paste is recommended in these cases, as more secure immobilization is required than in cases previously mentioned. Walking may commence the day after application of the plaster cast, and immobilization must be continued until there is firm bony union which usually takes ten to twelve weeks.

In case of (c) there is nearly always gross displacement, the central portion of the tibia being driven up into the joint between the two downward displaced condyles. Having ascertained the nature of the injury, manipulate gently (an anæsthetic will probably be necessary) until extension of the knee-joint is obtained. The limb is now immobilized on a back splint from the toes to the hip, with firm bandage around the knee-joint, and left for four days. At the end of this period reduction is commenced under an anæsthetic (spinal most useful). A Steinmann's pin is inserted through the lower end of the tibia (or os calcis) and the limb placed in a screw traction apparatus. A traction of 30 to 40 pounds is usually necessary to pull the central portion downwards. The condyles are manipulated until satisfactory reduction is obtained. The whole procedure is carried out by manipulation alternating with radiographic screening or directly under X-ray screen. The fractured condyles will usually remain in position if compressed with a heavy clamp, but if there is still a tendency to displacement, a Steinmann's pin

can be inserted through the upper third of the tibia in such a manner as to hold all three fragments. The limb is then immediately immobilized in plaster of Paris from toes to hip, without Unna's paste, the pin or pins being incorporated in the plaster cast. Extension is maintained by means of the pin in the lower end of the tibia for six weeks. At the end of this period, the cast and pins are removed and a new plaster applied from the toes up to and including the hip-joint in spica form.

A Böhler's walking iron is fitted and the patient allowed to walk for eight to ten weeks, at the end of which period immobilization can be terminated provided X-rays are satisfactory.

In all fractures involving a knee-joint, complete anatomical restoration of articular surface of the tibia is essential.

### 3.—*Fractures of the Upper, Middle and Lower Third of Tibia and Fibula.*

As soon as the signs of primary shock have subsided, the patient is allowed to sit up and a low spinal anæsthetic is given, stovaine being the most suitable. The patient is now moved to the X-ray room or to some place suitable for manipulation to be controlled by "screening." Having determined the injury by X-ray, a Steinmann's pin is inserted through the os calcis and the limb placed on Böhler's screw traction apparatus. 30 to 40 pounds traction is usually necessary to pull the fragments into almost correct position. Extension combined with alternatively manipulating and "screening" will give a satisfactory reduction of fragments.

With the limb still on the traction apparatus, a plaster of Paris cast is applied from the toes to the tibial tuberosity in case of fractures of the lower one-third of the leg, and from the toes to the hip in fractures of the middle and upper one-third of the tibia. To apply a plaster higher than the knee-joint while on the traction apparatus, it is necessary to do it in two stages. First, apply the plaster as far as the tibial tuberosity as in fractures of the lower one-third and then, as soon as the plaster has set, continue it above the knee by lowering the knee-bar of the traction apparatus. During the application of the proximal segment of the plaster, the knee must be supported in a flexed position suitable for accurate apposition to the Braun's frame.

A plaster from the toes to the tibial tuberosity is not sufficient to control fractures above the lower one-third of the leg unless a second Steinmann's pin is inserted through the upper one-third of the tibia. This second pin is usually necessary (as well as the long plaster) in cases of severe comminution and displacement.

As soon as the plaster has set, the patient is moved to the ward and the leg placed on a Braun's frame and extension of 12 to 15 pounds applied through a pin in the os calcis. This weight is reduced gradually to 4 or 5 pounds during the next two weeks.

The fracture is X-rayed every two weeks. At the end of six to eight weeks, if early union in a good position has occurred, the plaster and pin are removed and a new plaster cast applied from the toes to the hip, with the

knee a few degrees short of full extension. A walking iron is also incorporated in the plaster cast and the patient allowed to walk the next day. This plaster should be left on until good callus formation is visible. These fractures usually need immobilization for at least twelve weeks and often for as long as twenty weeks. Plaster casts should be renewed every seven or eight weeks.

In many cases even heavy extension in the long axis of the leg will not keep lateral displacement of the tibia reduced, especially in fractures of the lower third, particularly if they are compound. In these cases a system of pulleys should be arranged so as to enable lateral traction to be applied through a padded sling around the leg at, or near, the site of displacement. A lateral traction of 2 to 4 pounds combined with a longitudinal extension of 4 to 10 pounds will usually gradually reduce most types of lateral displacement. In using lateral traction the leg must be lightly strapped to the opposite side of Braun's frame to afford counter traction. The plaster under the padded sling must be softened or partially removed in order to allow satisfactory functioning of lateral traction.

In fractures of the tibia and fibula, the position of the tibia is all important. The position of the fibular fragments in some cases has to be ignored.

*Open Operation.*—This may be necessary when all attempts at reduction are prevented by muscle interposed between the fragments. The fragments of tibia (one usually ignores fibular fragments) are reduced by open operation (non-touch technique) and maintained in position by a steel plate (stainless steel gives best results) and screws. This plate should be removed in three to four months when good union has been attained.

#### 4.—*Fractures of the Tibia Alone (Upper, Middle and Lower Third).*

These are similarly treated, except that the intact fibula sometimes interferes with the reduction of the tibia and in such cases Böhler recommends oblique division of the fibula. In these cases I find it more satisfactory to operate on the fractured bone (tibia), and hold it in position by means of a stainless steel plate and screws.

#### 5.—*Fractures of the Fibula Alone (Above the Malleolus).*

These do not usually give rise to any difficulty except in cases of fracture of the neck of the fibula. In these cases, the head is pulled proximally by the biceps femoris and open operation is necessary. The displaced head is wired to the lower fragment. Other fractures of the fibula alone (excluding malleolus fractures) usually only require immobilization in a walking plaster for five to seven weeks.

#### 6.—*Fractures of the Malleoli.*

In some cases there is little or no displacement, but when this is present, it should be reduced as soon as possible. This is usually easy to do by manipulation under nitrous oxide or local anæsthesia. The limb can be immediately immobilized in a walking plaster-cast from the toes to the

tibial tuberosity. As considerable swelling is usually present when these cases are first seen, I adopt the following procedure :—

Any reduction is immediately carried out under nitrous oxide anæsthesia and the limb immobilized in a box splint for seven days. At the end of this period the swelling has nearly always subsided and the limb is immobilized in a walking plaster-cast from toes to tibial tuberosity. The next day the fracture is X-rayed and walking commenced if satisfactory. At the end of seven weeks the plaster-cast is removed and, if X-ray is satisfactory, immobilization is terminated. If adequate callus formation is not visible, the patient is confined to bed for forty-eight hours allowing full ankle movements. At the end of this period a new walking plaster-cast is applied and immobilization continued for another six weeks.

#### 7.—*Fractures of the Os Calcis.*

There are four recognized methods of treatment (Eastwood 1938).

- (i) Restoration of anatomical alignment.
- (ii) Application of plaster cast with foot in neutral position and arch moulded; no attempt being made to correct the deformity.
- (iii) Early arthrodesis of damaged subastragaloid joints.
- (iv) Late arthrodesis of damaged subastragaloid joints.

The first method is carried out by means of reduction with a pin in the os calcis on screw traction apparatus. A second pin is inserted through the lower end of the tibia, and both pins are incorporated in a plaster cast. Continuous extension is maintained *via* the pin in the os calcis on Braun's frame for four to six weeks. The basis of the method is the restoration of a normal salient angle of 38 to 40 degrees.

According to some surgeons the second method produces equally good results.

The third method is certainly undesirable as the subastragaloid joints are capable of considerable restoration of function, even when severely damaged. The condition may also end in painless arthrodesis without operation.

The fourth method may be worth while in some old cases complaining of pain probably originating in the subastragaloid joints.

*Summary of Treatment of Fractures of the Os Calcis.*—If gross displacement with decrease of salient angle is present, the first method of anatomical reduction should be carried out. The second method is suitable for cases with little or no displacement, or for cases of very severe comminution in which the insertion of a Steinmann's pin in the os calcis is contra-indicated.

#### 8.—*Fractures of the Talus, Navicular, Cuboid, Cuneiforms.*

(a) With little or no displacement: Immobilization in a walking plaster-cast for six to eight weeks, followed by the wearing of an arch support for three to four months after the removal of the cast. The wearing of an arch support is advisable owing to the tendency to develop flat foot.

(b) With gross displacement: Reduction is carried out by means of traction and counter-traction through a pin in the os calcis and Kirschner's wire through the bases of the metatarsals.

#### 9.—*Fractures of Metatarsals with Gross Displacement.*

Reduction by means of extension with the aid of a wire passed through the pulp of the toes and maintained for a few weeks on Braun's frame, followed by walking plaster and, finally, arch supports as described above. Usually satisfactory reduction can be obtained by manipulation without extension.

#### 10.—*The Treatment of Compound Fractures.*

All are agreed that, if seen within the first six to eight hours, excision of damaged soft tissue and skin edges and complete closure of the wound is the ideal method. If the skin edges cannot be united, or can only be united under tension, then the wound should be left widely open and lightly packed with gauze. The wound should not be partially closed.

Loose pieces of bone if connected with the main fragments should not be removed. Foreign bodies, such as bullets, pieces of shell, bomb, etc., should be removed if easily seen or palpated, but no extensive search should be made for them, as in doing so, the risk of infection will be considerably increased. They are usually sterile and can be removed months later without danger. Infected foreign bodies, such as pieces of clothing, must be removed if possible. Plaster of Paris is the ideal method of immobilization following reduction of the fracture and treatment of the wound.

I recommend immobilization in a plaster of Paris cast without a window for the first seven days. After this, a window is cut over the wound and its progress watched. Such a method should be suitable for the rapid evacuation of cases in war. The continuance of the closed plaster method after the first week may give excellent results in the hands of experts, but, for the general surgeon only treating the occasional compound fracture, it is a highly dangerous method owing to the extreme degree of sepsis which may have occurred by the time the first severe rise of temperature is shown.

In many cases the plaster cast will have to be split longitudinally during the first twenty-four hours, due to swelling obstructing the circulation. All compound fractures should receive 3,000 units of anti-tetanic serum and 4,000 units of anti-gas gangrene serum as soon as possible.

I regret that, in order to keep this article within reasonable limits, I have been forced to write dogmatically and with little explanation.

My thanks are due to Lieutenant-Colonel C. F. Burton, M.C., R.A.M.C. Officer Commanding British Military Hospital, Shanghai, for permission to submit this paper for publication.

#### REFERENCES.

- BOHLER, LORENZ, "The Treatment of Fractures," translated by Hey Groves, 1935.  
Simpkin Marshall, London.  
EASTWOOD, W. J. *Brit. Journ. Surg.*, 1938, **99**, 636.

## STREPTOCOCCAL AND STAPHYLOCOCCAL FEVERS.

BY CAPTAIN DEREK LEVIS, M.B., B.CHIR.CANTAB.,  
*Royal Army Medical Corps.*

### INTRODUCTION.

THIS short paper makes no pretence to state anything that is unknown to any of us. It contains few conclusions that we have not already reached. Its purpose is merely to emphasize some of the more important features of two very common but serious infections, namely streptococcal and staphylococcal fevers. A certain restriction of outlook having inevitably crept into our modern pathology, there was a tendency to regard the several manifestations of these infective processes as separate diseases. The primary lesion of each of these organisms was apt to obscure the composite clinical and pathological picture seen in the summation of their effects upon the body. This outlook, with its concentration upon the local disease processes, did not greatly influence practical therapy because treatment consisted of measures, more often than not surgical, directed towards the particular local disturbance and less towards the disease process as a whole. However, since the introduction of and the vast progress made in the use of specific chemotherapeutic substances as M & B 693, streptocide, sulphonamide, etc., the recognition of a general disease caused by streptococci and staphylococci has become of the utmost importance.

### STREPTOCOCCAL FEVER.

Although minor grades of streptococcal infection such as tonsillitis and sinusitis are amongst the commonest of the human infirmities, the severer septicæmic and bacteræmic forms of the disease are not unknown to us, although mercifully they are not of everyday occurrence.

The following three cases show many of the salient features and from them we may be permitted to draw certain conclusions in regard to the natural history, course, prognosis and treatment of streptococcal fevers.

*Case 1.*—Private S., aged 24, an infantryman of approximately two years' service in Shanghai. This man was admitted at 4 a.m. to the British Military Hospital complaining of a very sore throat, which he had had for two days, high fever and a shivering attack just before admission, during which he vomited once. The patient looked ill and exhausted. His throat showed intense inflammation with marked swelling of both tonsils, temperature 102·4° F., pulse 100. His heart sounds were of poor quality. In view of a prevailing outbreak of diphtheria among the soldiers of his battalion at the time he received 20,000 units of anti-diphtheritic serum once pending the result of a throat swab. This was returned negative the following day. He was recognized as a case of streptococcal fever and

received 10 c.c. of anti-streptococcal serum the morning after admission. He received a further 20 c.c. eight hours later. Between the time of his admission and midnight on the following day he received eight grammes of streptocide. His condition that evening was very poor. His temperature had risen to 103° F. and his pulse to 130. His white blood-count was 14,000 white cells per c.mm. He was a little better the following day, his temperature having dropped to 100·6° F. and his pulse to 110. His throat was still very dirty. He was receiving one gramme of streptocide four-hourly. The next day improvement was again noticed but his spleen had become palpable and tender and his urine contained albumin and red cells. His temperature rose again the following day. He looked worse and complained of pain and tenderness in his left knee. His spleen was still obvious. For seven days he continued with a high fever and rapid pulse. The same dosage of streptocide was continued. His temperature then subsided to normal and although his throat was still inflamed it was no longer painful. As he was showing a slight degree of cyanosis the streptocide was discontinued. Two days later he had an exacerbation of his fever. No further local signs were discovered and his urine was clear. He was once more placed on streptocide which was continued for a further five days. His temperature then subsided and convalescence commenced.

*Case 2.*—Corporal H., aged 35, clerk in the R.A.M.C. This man, while in hospital convalescing from a left basal pneumonia, for which he received M & B 693, developed a slight evening temperature and a mild sore throat. He had been getting up and was about the ward. He was a fat, flabby, unhealthy looking individual, and a W.B.C. taken during the course of his pneumonia revealed a count of 17,400 white cells per c.mm. His throat was inflamed, but this began to subside. Eight days after its onset he had a sudden shivering attack and developed: (1) an acute sore throat with pus-streaked tonsils, (2) tenderness and cutaneous hyperæsthesia in the right iliac fossa, and (3) acute tenderness over the gall-bladder. His temperature was 101·8° F., pulse 130. In addition, he complained of præcordial pain which radiated down the inner side of his left arm. His pulse was extremely rapid and his heart sounds were of very poor quality. A W.B.C. at this stage was 8,200 per c.mm. He was placed on tablets of streptocide, two four-hourly. The following day his condition was unchanged, except for quite a marked dyspnoea apparent on moving about in bed. His W.B.C. had risen to 10,000 per c.mm. His throat was still sore. A throat swab showed K.L.B., and he was transferred to the Isolation Division. He received 30,000 units A.D.S., and the dosage of streptocide was increased to four tablets four-hourly. The following day there was improvement and his temperature had subsided to 99·6° F., his W.B.C. to 12,400 per c.mm. The heart sounds were still poor and dyspnoea still present. His condition improved, streptocide was reduced to one tablet every four hours, and after six days more was discontinued. Improvement was maintained and his temperature remained normal, although his pulse still rose

on any slight effort or movement. His W.B.C. was now 8,200 per c.mm. He still remains in bed. Tenderness has left his appendix, but there is still a definite inspiratory catching of his breath on palpating the gall-bladder. Tachycardia and dyspnoea are still easily produced.

Case 3.—Private G., aged 24. This patient was admitted complaining of fever, shivering and a very sore throat, temperature  $102.2^{\circ}$  F., and pulse 120. Speech was difficult owing to a gross inflammation of the tonsils and œdema of the surrounding tissues. The urine contained large quantities of albumin (5 gr. per litre). A throat swab was negative for K.L.B. Streptococcal fever was diagnosed and he received two tablets of streptocide every four hours for four days. His temperature then subsided and he felt better. Three days later his temperature rose again to  $100^{\circ}$  F., and remained up for two days. During this period he received only local treatment to the throat condition. He was then placed again on streptocide, two tablets three times a day. The fever did not subside and his condition deteriorated, and the dosage was increased to two tablets four-hourly. In addition he received 10 c.c. of anti-streptococcal serum. This dosage of streptocide was continued for four days and for a further day after his temperature had subsided to normal. His fever subsided gradually. The dosage was then cut down to one tablet four-hourly for three days, and then one three times a day for two days, and his recovery was complete. Throughout the acute stage of his illness his urine was loaded with albumin, but no casts or R.B.C.s were ever seen. Quantities of albumin up to 1 gr. per litre were noted.

These three cases all have certain features in common; each of them demonstrates incidents which may occur in any case of streptococcal fever. They all had the same original focus of infection, the mucous surface of unhealthy tonsils. In Case 1 the portal of entry had been well prepared for the streptococcal invasion by a previous attack of Vincent's angina and ulcerative gingivitis.

In streptococcal fever, however, the portal of entry varies widely, the large raw area of the placental site contrasting with the insignificant hangnail of the overworked medical man, while the unhealthy cryptic tonsils of cases such as the three just quoted occupy an intermediate position.

The onset of the disease is sudden and is characterized by the occurrence of high fever, malaise, chilliness and actual rigors. This was a marked feature in all these cases. The organism spreads rapidly throughout the body. The fever remains high, rarely descending to the base line, while the pulse is extremely rapid. There is a marked systemic disturbance. In all these cases there was a marked primary local infection of the tonsils.

In two cases, one of which I have not reported, there was a marked secondary disturbance which resulted in rapid splenic enlargement, which was accompanied by a considerable degree of pain and abdominal discomfort, due no doubt to an accompanying amount of perisplenitis. Further secondary manifestations were observed in Case 2. Here, after an initial tonsillitis, the appendix, the myocardium and the gall-bladder were all rapidly and



successively involved. The tendency for these fevers to have metastatic manifestations in organs with mucous surfaces was well marked in this case. Although the appendix has more or less settled down, the gall-bladder is still inflamed, and will, I think, come to another acute exacerbation. This patient is going to present a considerable problem as to his future treatment as one is left a little uncertain where to start. At present the consensus of opinion leans towards his tonsils.

Metastases into the serous sacs are a further feature of streptococcal fevers and although in this small series there was no actual incidence of this, in Case 1 the occurrence of pain and tenderness in the left knee was suggestive of an abortive attempt at an arthritis and an effusion into the joint by the streptococcus which was wandering through the body. Did chemotherapy abort this occurrence? I am tempted to think that it did.

In one other case, about which I was unable to obtain any notes, a severe diarrhoea with blood and mucus in the stools, occurred. This case was in many aspects similar to Case 1. A general infection followed a very septic throat and after a few days' illness characterized by rigors, sweating, fever and a rapid and painful enlargement of the spleen, he developed a quite marked distension with tympanites and discomfort and this was accompanied by dysenteric manifestations, the stool growing nothing on culture. This case, by the way, also received anti-streptococcal serum and large doses of streptocide and made a good recovery.

There is a further secondary manifestation upon the body in these streptococcal fevers. I refer to the effects of the infection upon the kidneys. In two of the three cases quoted, urinary changes were recorded. In Case 3, a severe infection of the throat, a very heavy albuminuria was noted, which subsided and disappeared with his recovery. At no time were red blood cells or casts discovered. Contrast this with the first case reported, where albumin and red blood corpuscles were observed. This case also cleared up. These two cases show two types of renal involvement. The first one, with the heavy albuminuria with no red cells or casts, I am inclined to regard as a larval nephrosis, the pathological change probably being a severe degree of cloudy swelling of the kidney tubules. The second case showing albumin and red cells was probably a focal glomerulonephritis and would have shown the corresponding pathological changes. Not all cases clear up as did these two. Diffuse glomerulonephritis can, and does, occur as a manifestation of streptococcal fever and permanent renal damage may ensue.

This mention of renal involvement in streptococcal fever brings to our notice another well-defined type of case. I refer to scarlet fever.

This is a streptococcal fever with the initial lesion in the mucous membrane of the throat. It has a well-marked onset with fever and vomiting, accompanied by a considerable degree of tachycardia. It has, as a secondary manifestation, the evidence of renal damage. In short, it presents every feature shown by the cases reported earlier on in this paper, but it has a characteristic skin manifestation.

Why this should occur in some individuals who have a streptococcal fever and not in others with identically the same fever, gives rise to some thought.

Is the erythema of scarlet fever an outward and visible sign of a pre-existing sensitivity in certain individuals towards the streptococcal exotoxin ?

Should we regard all streptococcal fevers accompanied by a tonsillitis as legally defined infectious diseases and act accordingly ?

It is on this note of interrogation that I will leave the clinical aspect of the streptococcal fevers and pass on to some consideration of their prognosis and treatment.

#### PROGNOSIS AND TREATMENT.

Since the introduction of the sulphonamide group of drugs the prognosis of the streptococcal fevers has improved out of all knowledge. Take for example Case 2. This case had a poor leucocytosis even with his initial pneumonia. He was a type ill-adapted to deal with a severe infection and his chances in the pre-sulphonamide days would indeed have been gloomy. We have now a potent weapon forged to our hands for the prevention of the development of those localizing manifestations for which we used to wait with mixed feelings of hope and fear ; hope, that their development would assist the patient in his struggle against the disease ; fear, that they would develop in sites which would render us impotent to interfere surgically. The constitution of the individual and the leucocytic response are guides to prognosis, but specific chemotherapy and its immediate effects are more often the key.

#### TREATMENT.

Although in this connexion any contribution of mine will not be original, there are one or two points well worth emphasizing, particularly in connexion with the chemotherapy of these fevers.

The first point is this : that no matter what brand or type of sulphonamide is employed, the initial dosage must be high and the dosage must be maintained at a high level during the early stages of the disease. These drugs are rapidly excreted in the urine and it is of the utmost importance that a high serum concentration of them be obtained in the early stages. If given in small doses such a serum concentration as would be adequate to interfere with the metabolism of the circulating bacteria (as indeed is the probable mode of action of these drugs), is never obtained in severe cases. Its premature withdrawal has the same effect and the infection once again regains the upper hand. This is shown in Cases 1 and 3. In both these cases the drug was stopped too soon and a recurrence of the fever occurred.

The next point is the incidence of *cyanosis* in cases receiving these drugs. Case 1, when on the way to recovery, showed a slight cyanosis which resulted in the stoppage of the drug. He relapsed as soon as it was discontinued,

improving again on the drug being readministered to the point where a mild cyanosis re-occurred. I am of the opinion that cyanosis in a moderate degree does not matter and that it may be taken as a sign of adequate dosage and sufficiently high plasma content of the drug for bactericidal purposes.

In any case it can be dispersed by the administration of methylene blue.

White blood-counts carried out on these patients, although perhaps on the low side for an adequate natural aid to recovery, showed no evidence of *agranulocytosis*. This complication is, I think, rare, and is a possibility more to be *aware* of, than to be *afraid* of, in connexion with the use of these drugs.

Finally, the place of anti-streptococcal serum. Two of the cases quoted were considered ill enough to receive serum in addition to streptocide. Some authorities regard serum as a life-saving measure, others deny its use to be of value. I think its use is best regarded in the following way. "Serum by itself is effective, streptocide by itself is effective, but both together, they are an extremely powerful weapon."

Last, but not least, comes the consideration of *general* treatment. This is mainly directed towards mobilizing the natural defences to meet the emergency. An adequate fluid intake of sweetened drinks, attention to the pain and discomfort of the local lesion and the maintenance of the general well being of the patient all have their place. Above all, do not let us forget the treatment, during convalescence, of the inevitable anæmia which has occurred and will always occur in every case of streptococcal fever.

#### STAPHYLOCOCCAL FEVER.

By contrast to the preceding type of infection the portal of entry of the staphylococcus is the skin. The primary lesion is on the body surface and takes the form of a boil, carbuncle or minor pimple. Mucosal infection is rare. Staphylococcal infections such as these constitute a considerable proportion of the infirmities with which we are called upon to deal, more especially in military practice where minor injuries and abrasions, with a superadded staphylococcal infection, are extremely common. The familiar diagnosis of I.A.T. has its origin in the majority of cases from the *Staphylococcus aureus*. Such infective processes, fortunately, rarely proceed further than the local lesion. Localization is generally good, there is a sound tissue response and the affair ends at this point.

Occasionally, however, such infections may catch the body "napping" as it were and a bacteræmia supervenes. A general infection is now complicating a local lesion. Occasionally it happens that the local lesion may not be discoverable at the time of onset of the fever. It has come and gone but not before it has left its fingerprints. In suspected cases of staphylococcal fever, therefore, a careful clinical history is of the utmost value in diagnosis and the forgotten occurrence, a short time previously, of a local septic lesion may be the clue required to solve the puzzle in an unknown febrile disorder. Generally speaking, the onset of a staphylococcal fever is quite sudden.

The initial bacteræmia giving rise to fever, shivering and malaise, sometimes even rigors occurring. This is less usual and not so often the case as in a streptococcal fever. The pulse, although rapid, is never raised to the same extent and consequently other infections, such as the enteric group or influenza, may be suspected.

There is no enlargement of the spleen and localizing signs are generally rapid in making their appearance. In nearly all cases there is a bacteræmia with ultimately a demonstrable metastasis or fixation abscess. Such a metastasis may be solitary or it may multiply in various tissues of the body, depending on how the body itself is dealing with the temporarily circulating organism.

Staphylococcal metastases show a preference for the more solid tissues. We are familiar with the organism settling down in the capillary loops at the diaphyseal ends of the bones, giving rise to a picture of acute osteomyelitis. We know only too well of the possibilities of perinephric infection. We have seen from time to time collections of staphylococcal pus in the muscles and tissue planes.

Contrast this with the streptococcus whose choice falls upon the serous lined cavities and the mucous membrane of internal organs.

The continued fever, in the absence of rigors or sweats, with the fairly rapid formation of a local abscess, is in favour of a staphylococcal bacteræmia, more especially if the fever clears up upon drainage of that local abscess. It is the occurrence of these local collections of pus or the pre-purulent stage of tissue infection which places such a high diagnostic value upon an early leucocyte count. It has been stated previously that the pulse-rate is slow in proportion to the degree of fever and this early white count will be of material assistance in excluding infections such as the enteric group which have an initial leucopenia.

Furthermore, it is a guide to treatment with particular reference to surgical interference as I will try to show from the case reported below.

This case in many ways shows most of the features of a typical staphylococcal fever. The clinical history, its onset, its course, diagnosis and treatment present a picture of the natural history of the disorder almost in its entirety.

*Case 1.*—Private R. This patient was a sturdy well-built soldier, aged 23. His duties as an orderly in the dining hall, cookhouse and with the dishwashing plant entailed heavy work and fairly long hours. Three weeks prior to his admission to hospital, I had incised and drained a local abscess on one of his fingers. A large slough was removed and the hand recovered rapidly. He returned to work and forgot completely about it.

On January 2 he reported sick saying he had been shivering and felt ill, and that he had a severe pain in his right loin. He was doubled over to the affected side and all around the right renal area he was acutely tender. His temperature was 100° F., and his pulse 90. He had frequency of micturition. The urine was acid and contained a few pus cells. He was admitted at once

to hospital and placed on fluids and alkalies, four-hourly. The diagnosis of acute pyelitis was made. The following day he had red cells in his urine. The pain was worse and his fever still high. It remained up between 100° F., and 102° F., and never subsided to the base line. Three days after admission his W.B.C. was 8,000 per c.mm. (82 per cent polymorphs). A straight X-ray of the renal area showed nothing. His fever continued and he had one or two severe sweats. His urine became clear. A diagnosis of perinephric abscess was considered at this stage. Ten days after admission he was placed on M & B 693 two tablets four-hourly, and received this quantity for seven days. It had no effect at all on his fever and was discontinued. During this period his respirations were raised and a dullness developed at the right lung base. Aspiration failed to reveal any fluid. Seventeen days after admission his W.B.C. was 13,600 per c.mm. An intravenous pyelogram was done and showed no abnormality. The next day his W.B.C. was 14,200 per c.mm.

Operation and exploration of the right renal area were considered at this point, but the fact that the W.B.C. never reached a really high figure decided us against it and natural resolution was considered a possibility. Besides it was thought that in all probability no pus would be present, or at the most about a drachm among cedematous perirenal fat. Twenty-three days after admission his temperature started to subside and on the twenty-seventh day of his illness it was normal, and his W.B.C. had dropped to 11,400 per c.mm. Retrograde pyelography showed nothing. His temperature has remained down and his recovery has been uneventful. Except in the initial stage of the fever his urine remained clear.

This case demonstrates well, I think, several features of a staphylococcal fever. The history of a septic lesion in the hand revealed a point in its aetiology. The fact that he forgot about it shows the value of a careful clinical history, particularly with reference to the occurrence of local septic conditions. Its sudden onset, with the initial bacteræmic symptoms and its rapidly developing metastatic manifestation in the solid tissues surrounding the kidney are all part of the same picture. The high fever, with its relatively slow pulse, the rising leucocyte count and its aid to diagnosis are all points which I wish to stress.

A further point in this case which weighed against operation was the negative finding with X-rays. There was no loss or blurring of the outline of the border of the psoas muscle on the affected side. In a well-developed perinephric abscess, this is quite a constant feature and is of considerable diagnostic value.

There is one feature of this case which is not in accord with the true picture of a well-defined staphylococcal perinephric metastasis. It will have occurred to the reader that the urinary findings are not quite consistent with a perinephric abscess of this type. On admission this patient had pus cells in his urine and the following day he had red blood corpuscles in addition. This is the exception rather than the rule. It will be recalled that

it is the streptococcal fevers which prefer the actual kidney tissue and which can inflict an actual nephritis. This occurrence can be explained, however, if we pause to consider the various ways in which a perinephritis can occur. There are, generally speaking, three ways in which this may happen:

(1) By blood-borne infections. Here the organism reaches the renal cortex *via* the blood-stream from a primary local lesion. It forms a sub-cortical abscess, which bursts outwards through the tissue planes to give rise to perinephric cellulitis.

(2) From an already infected and disorganized kidney, the infection arising by a direct outward extension.

(3) From an infection, co-existing in the pelvis, for example, a pyosalpinx, spreading upwards *via* the retroperitoneal lymphatics.

In those cases having their origin under group (1) (infection *via* the blood from a distant focus) urinary findings are unlikely although there is no reason for them not to occur, as indeed they did in this case by the subcortical abscess touching the tip of a calyx and giving rise to some degree of inflammation of the renal pelvis. •

In group (2) urinary findings are generally refreshingly obvious while in group (3) their occurrence depends on the relationship of the urinary apparatus to the initial focus.

Although much of what I have just said may appear rather far from the point in a discussion upon staphylococcal fever, it may be stated that, apart from the occurrence of osteomyelitis, perinephric abscess is one of the commonest, and at the same time one of the most obscure, manifestations of staphylococcal fever and gives rise to a very real difficulty in diagnosis.

Features enabling us to point a finger in its direction are the onset of a fever following the occurrence of a local skin infection, the finding of a tender spot, the raised white cell count, and, generally, the negative urine findings. Radiography, in a well-developed case, reveals loss of clearness in the outline of the psoas muscle, while pyelography both intravenous and retrograde in a classical case, generally reveals a normal pelvis and calyces, as it did in this case. In one case, however, which occurred recently in the military hospital a slight degree of hydronephrosis was observed. This case came to operation and a large quantity of pus was evacuated from the perirenal area. The degree of hydronephrosis in this case may be explained, I think, by the large amount of perirenal oedema and consequent slight pressure upon the ureto-pelvic junction which must occur in such cases and will almost invariably interfere with adequate natural function at this point. I do not think that there were any positive urinary findings in this case prior to operation.

Such statement and speculation as I may have put forward have resulted from the consideration of two cases of staphylococcal fever. Their natural history has been noted and the value of urinary findings and X rays discussed in connexion with the diagnosis of such manifestations of staphylococcal infection.

The question of treatment now obtrudes itself. With regard to these fevers we are not so fortunate in our therapeutic armament, as a modification of streptocide or M & B which is equally effective for staphylococcal as well as streptococcal infection remains to be discovered. In staphylococcal fevers the results of chemotherapy are disappointing. Both the cases received adequate doses of these drugs which were continued for an adequate time for their effects to be observed. In neither case did they have any effect upon the fever although whether or not they saved Case I from operation is a matter for some thought.

The use of staphylococcal toxoid has not fulfilled its early promise, more particularly in those types of fevers due to repeated staphylococcal skin infections. So we are forced back upon the general treatment of these cases, with careful nursing and observation, and with surgical intervention at such times and in such places as we may deem suitable.

#### CONCLUSION.

It will have been seen from these few observations that the clinical features of streptococcal and staphylococcal fevers are painted on a large canvas with a very generous brush. The local lesion of each is only a part, and a very small part of this picture.

The difference in their choice of site for metastasis, their secondary manifestations, particularly in regard to the kidney, together with their chemotherapy, are all features which compel our attention to these two disorders and which to some extent exercise us in taking what Sir William Gull has so concisely called "the General View."

---

## TREATMENT OF GONORRHOEA WITH M & B 693.

BY MAJOR J. M. OFFICER,  
*Royal Army Medical Corps.*

IN the past two years the results of the treatment of gonorrhœa with sulphapyridine (M & B 693) have been fully reported, but very little has been published on the chemotherapy of gonorrhœa in the Army.

The great difference between army and civilian treatment is that in the former case all cases are treated in hospital and this has the following advantages :—

(1) The issue of tablets can be supervised and it is thus certain that the patient is receiving them.

(2) The progress of treatment can be judged on the early morning smears.

(3) The question of "default," which is a major issue in civilian clinics (*vide* Batchelor, Lees and Thomson [1]), does not arise in the Army.

Since May, 1939, 265 cases of gonococcal urethritis have been treated with M & B 693 as follows :—

### GROUP "A." CASES OF ACUTE ANTERIOR GONOCOCCAL URETHRITIS.

This group consisted of 141 cases and all were given a four days' massive treatment with M & B 693, with the idea that the higher the initial dose, the speedier the cure and the greater proportion of cures.

This treatment was on the lines laid down by Bowie, Anderson, Dawson and Mackay [2], and consisted in :—

First Day : 8 (0.5 grm.) tablets on admission, 4 tablets every four hours. (Total 16.)

Second Day : 2 tablets every four hours. (Total 10.)

Third Day : As for second day.

Fourth Day : 6 tablets divided into four doses. 2 : 1 : 1 : 2.

All tablets were given crushed up and taken with water. A drink of glucose and soda bic. was given with each dose of tablets.

An alkaline diuretic was also given and the patient made to drink at least 3 pints of barley water per day. Irrigations were only required in a few cases.

On the second morning the patient usually showed no gonococci and was almost dry. On the fourth or fifth day he was given sounds and prostatic massage and, if findings were negative, treatment was stopped and he was discharged hospital on or about the tenth day, after having had two negative prostatic smears.

Of the 141 cases treated, 130 (92.1 per cent) were discharged hospital to surveillance—apparently cured—after an average of 11.3 days. Cases



were usually marked fit for full duty within fourteen days of leaving hospital, but a few commenced full duty immediately at their own request.

The following cases are typical examples :—

*Case 1.*—January 4, 1940 : Admitted with profuse yellow discharge ; gonococci present. Urines (1) hazy, (2) clear. Placed under treatment with M & B 693 same date.

January 5 : Thin white discharge, gonococci absent. Urines clear. Sounds revealed no abnormality, prostate normal and prostatic smear was free from pus cells and organisms.

January 6 : No smear available.

January 7 : Treatment stopped.

January 9 : No smear available. Urines clear. Prostate and prostatic smear normal.

January 10 : Discharged hospital to full duty and surveillance.

January 14 : Played wing three-quarter for his battalion and scored two tries without any apparent ill-effects.

*Case 2.*—January 8, 1940 : Admitted with profuse yellow discharge ; gonococci present. Urines (1) hazy, (2) clear. Placed under treatment with M & B 693 same date.

January 9 : No smear available. Urines clear.

January 10 : Sounds revealed no abnormality. Prostate normal and prostatic smear was free from pus cells and organisms.

January 11 : Treatment stopped.

January 14 : No smear available. Urines clear. Prostate normal. Discharged to full duty and surveillance.

January 20 : Played football for his battalion without any ill-effects.

*Relapses.*—Out of 130 cases discharged hospital to surveillance, only five cases relapsed at a later date. All except one relapsed within two months of leaving hospital.

*Failures.*—Eleven cases still showed gonococci after four days' treatment but all except two of these responded to M & B 693 at a later date and were out of hospital within two months. It was found on further investigation that the majority of these cases had neglected to report sick until seven to ten days after they had noticed the discharge.

*Toxic Effects.*—Patients were not confined to bed unless the drug upset them. A few cases complained of nausea and a few of headache. One case developed jaundice and one developed urticaria. All ill-effects quickly disappeared when the drug was stopped.

#### GROUP " B." CASES IN WHICH A POSTERIOR GONOCOCCAL URETHRITIS WAS SUSPECTED.

This group consisted of 124 cases. In all cases the second urine was hazy, and on admission 11 were suffering from an epididymitis, 21 from an enlarged prostate and 1 from arthritis.

Treatment was on similar lines to that given to those cases in Group "A," except that a longer and less intensive course of M & B 693 was given.

Six tablets of M & B 693 were given daily for five days and four tablets daily were given for a further three to five days. Irrigations were only required in a few cases.

Of the 124 cases treated, 107 (86·3 per cent) were discharged hospital to surveillance—apparently cured—after an average of 16·9 days in hospital. Cases were marked fit for full duty within fourteen days of leaving hospital.

*Relapses.*—Out of 107 cases discharged to surveillance, only four cases relapsed at a later date. All except one relapsed within two months of leaving hospital.

*Failures.*—There were 17 cases; of these two had epididymitis and two had prostatitis on admission. Only two of these men were in hospital longer than two months.

*Toxic Effects.*—As regards toxic reactions, as with the more intensive course, a few suffered from nausea, two developed a rash and two developed jaundice, but all quickly recovered when the drug was stopped.

*Standard of Cure.*—Patients were kept in hospital for four days after all treatment had ceased. During this time, in addition to the absence of urethral discharge and clear urines, prostatic smears had to be free from pathogenic organisms and relatively free from pus cells on two occasions. Instrumental investigation had to show no abnormality.

Patients were kept under surveillance for two months after leaving hospital, during which time they were carefully examined at weekly or fortnightly intervals.

*Relapses.*—As has been seen, the relapse rate was low, the percentage of relapses in the acute anterior infections (Group "A") was only 3·8 per cent and that of the posterior infections (Group "B") was 3·7 per cent.

Although patients were only kept under surveillance for two months, the possibility of late relapses, as was found by Cokkinis and McElligott [3], was remembered, and it was possible to keep patients under observation for a year or longer, as all cases of gonorrhœa occurring subsequent to two months after leaving hospital were seen by me.

#### SUMMARY.

(1) A short intensive course of M & B 693, lasting four days, was sufficient to effect a clinical cure in 130 cases out of a series of 141 cases.

(2) The relapse rate was small, there being only five relapses (3·8 per cent).

(3) There were less toxic reactions than with the usual eight to ten days' course.

(4) It is suggested that the higher the initial dose, the speedier may be the cure and the greater the proportion of cures.

(5) Treatment in bed was only necessary in a few patients who felt upset by the drug.

(6) All were fit for full duty within fourteen days of leaving hospital and some commenced full duty and organized games on the day they left hospital.

(7) The results are summarized in the following table :—

	Total No. treated	No. apparently cured	Average stay in hospital	Failures	Relapses
GROUP " A "	141	130 (92·1%)	11·3 days	11	5 (3·8%)
GROUP " B "	124	107 (86·3%)	16·9 days	17	4 (3·7%)

In conclusion, the writer would like to thank Colonel J. T. Simson, A.D.M.S., China Command, and Lieutenant-Colonel C. Armstrong, *M.B.E.*, R.A.M.C., O.C. Combined Military Hospital, Kowloon, for permission to forward these notes for publication.

#### REFERENCES.

- [1] BATCHELOR, LEES AND THOMSON, *British Medical Journal*, June 15, 1940.
- [2] BOWIE, ANDERSON, DAWSON AND MACKAY, *ibid.*, April 8, 1939.
- [3] COKKINIS AND McELLIGOTT, *ibid.*, December 2, 1939.



## Editorial.

### FOOD : USE OF POTATO FLOUR.<sup>1</sup>

In a letter to *The Times*, December 30, Lord Bledisloe points out that a possible effect of the recent correspondence about different forms of wheaten bread (whether sophisticated or not) may be to deflect the public mind and the land cultivators' activities away from the potato, which is a more health-giving and a far more secure bread stuff than wheat. This, he says, is the one rooted conviction which he derived from his work in the Ministry of Food in 1917-18. He considers that the shipping outlook to-day weights the scale far more than ever on the one food comparable to wheat, the whole of which can be raised from our own soil by our own people. It is not vulnerable like corn crops and stacks and if there is a surplus it can be made available for every description of livestock with the proviso that boiling or steaming is requisite for pigs. He believes that the main deterrent to the frank recognition by the Ministry of Agriculture of the potato as affording our people an absolute security against starvation is the apprehension of unfair competition in food output with the British farmer (except possibly in Lincolnshire, the Lothians and Forfarshire) on the part of allotment holders and other small-scale producers. The fear of the farmer is negligible and the number of small-scale producers should be increased to at least three times the number advocated by the Minister of Agriculture.

Lord Bledisloe writes that the sole ponderable arguments adduced in 1917 against the above contention were: (1) That farina mills, which are essential to the output of potato flour of the highest quality and fineness, were an uneconomical proposition in Great Britain and (2) there is an ineradicable British prejudice in favour of a white wheaten loaf, however appetizing may be the products of its chief carbohydrate competitor. To Lord Bledisloe it is inconceivable that any such prejudice should stand in the way of the speedy winning of the present disastrous war. In conclusion, he summarizes those factors which under existing conditions should carry special weight with those responsible for our national food supply. In the first place, the average yield per acre of potatoes is exactly  $7\frac{1}{2}$  times the average yield of wheat, after in each case allowing for seed. As, therefore, for any given weight of the former a far smaller arable area is required, this consideration is fortified by the paramount importance of milk, and the difficulty of inducing dairy farmers, particularly in the West Country, to maintain their full quota of dairy cattle after ploughing up a considerable part of their permanent pasture. Secondly, potatoes yield per acre more than double the energy, reckoned in calories, than wheat does (4,700,000 calories as against 2,100,000 for wheat). Thirdly, potatoes are richer in vitamins. But in either case, these need supplementing with milk, green vegetables, or fruit. Wheaten bread is not Britain's staff of life in war time.

---

<sup>1</sup> By the late Sir William Horrocks.

## Clinical and other Notes.

---

### A CLOSED SYSTEM OF WATER DISPOSAL BY SURFACE EVAPORATION.

BY CAPTAIN H. B. L. DIXON,  
*Royal Army Medical Corps.*

DURING the past year it has been my experience, as medical officer to a Searchlight Unit, that one of the major problems in the maintenance of good sanitary conditions on searchlight sites has been the satisfactory disposal of waste waters.

The ground in my particular bit of England will not absorb a drop of water except, perhaps, in the uppermost six to ten inches, below which it consists of clay to an unknown depth, and sumps of the usual pattern have been outstanding failures. Larger and deeper sumps have merely postponed the day of overflowing and in wet weather have acted as receptacles for surface water. Herring-bone systems of trenches have been used and discarded. They look ugly, take up too much room, get in the way and have bred flies; and they, too, have filled up and overflowed. Even when filled with rubble and returfed they have discharged waste waters upon the surface at various points, not to the benefit of the site.

By exposing a large surface area to the air and relying upon evaporation the trouble was eventually overcome in a very satisfactory manner, grass and in some cases, flowers being utilized to supply the necessary area. At no time is the waste water itself left naked to the air.

A large shallow sump is first prepared and, for reasons which will become apparent, this is usually circular in shape. For a site with a personnel of eighteen it should not be less than eighteen feet in diameter and, where water is laid on to the site, not less than twenty-four feet, as more water is invariably used on such a site.

It is essential that its floor should be precisely in the horizontal plane in order that water can maintain an even depth at all parts. It need be no more than one foot in depth, though it is obvious that on sloping ground deeper excavation will be required at the upper aspect of the sump, in order to attain a horizontal floor.

On flat ground the excavated soil can be carted away. On sloping ground it, or part of it, should be neatly banked around the upper margins to form a buttress against flooding by surface waters in wet weather.

A field drain is laid upon the floor, in trident form, from the point of entry to the more outlying parts of the sump.

The floor is then covered to a depth of about six inches with small

clinker or rubble which should be firmly pressed in by walking over it or by rolling.

A three-inch layer of cinders mixed with soil is superimposed upon the clinker, and this, too, is firmly walked in.

Finally, a layer of fresh turf is laid upon the soil and, again, this should be rolled or otherwise pressed firmly home. It is well worth while to obtain good quality turf for this purpose rather than to use the (usually) rank grass originally lifted from the spot and in no case should old dry stuff be used.

The sump is now ready for action. It should be nursed a little at first until the turf has obtained good root-hold and care should be taken to maintain the maximum degree of cleanliness in the water which is to enter it, by giving all necessary care to the grease trap.



Sketch showing general view of sump with built-up banking on the upper side, to prevent surface flooding.

As the roots of the turf strike into the wet underlying strata the grass growth soon becomes lush and it has been found advantageous to crop it from time to time and, in fact, to treat it rather as a lawn. It will be seen that water is disposed of by evaporation through the grass blades which, by their number and shape increase the exposed area to a prodigious degree.

For those with a decorative urge, segments of turf can be lifted and replaced by soil, in which flowers usually flourish ; but it is as well to wait for a month or two before disturbing the turf for this purpose.

A further advantage of this type of sump is that, being sealed by turf, it is immune from air-borne contamination and, in my experience, is quite free from any unpleasant smell even when there are no flowers. Far from

becoming malodorous in hot weather it attains its maximum efficiency at such times. What will happen in winter yet remains to be seen; but, in any case, it cannot well become less efficient than any other scheme of water disposal short of direct drainage into a sewer.

A difficulty which will be encountered in preparing such a sump is that of determining when a floor is horizontal. In the first two or three examples which, from force of habit, were made square, it was amusing to see the methods improvised by various D.C.s. One man found that by shutting his eyes and walking about in the sump he could tell when he was going up-hill or down. We gave him the job of tramping the cinders in. Another tested his by rolling a football about and noting any bias it took. A third employed the distinctly messy procedure of pouring water over the floor which rapidly became grimly adhesive as well as very dirty.

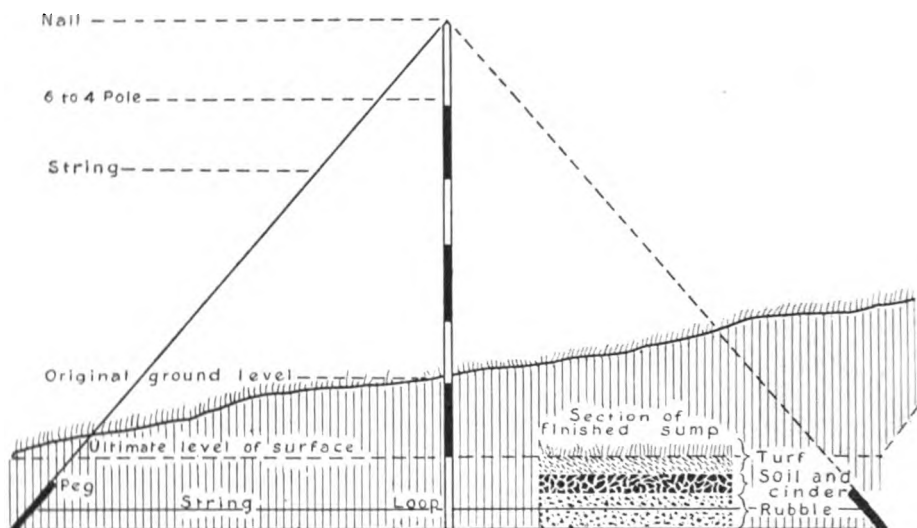


Diagram showing use of 6 to 4 pole and string to obtain horizontal base.

The following method was ultimately adopted :—

Firstly, a peg is driven into the ground at a spot chosen as the centre of the sump.

Secondly, by means of a radial piece of string, a circle is marked out to the size of the sump and digging is at once proceeded with, the peg being replaced by a pole (a 6-to-4 line pole) driven deeply into the ground, as vertically as possible, to mark the centre as digging proceeds.

Digging continues until the sump appears about correct, that is until it is a foot deep at its lower end and anything from two to three feet deep at its uppermost side, according to the slope of the ground, and the floor apparently horizontal. On sloping ground there is an optical illusion that the floor slopes steeply into the hillside.

The pole is then removed and a long piece of string is looped to a nail driven into the centre of the head of the pole.

The pole is then replaced, great care being taken that it is exactly vertical, the string being used as a plumb-line, and is firmly packed in position by stamping the clay hard down around its foot.

The string is then carried to the outer edge of the floor and an object such as a tent peg tied to the string so that its point just reaches the outer edge.

With the peg held in this position, the string is then taken back to the foot of the pole to which it is fastened by a loose loop and forms, as nearly as can be judged, a right angle with the pole.

The string and pole thus form a right angled triangle with the pole as a fixed vertical side and, by carrying the apex (tent peg) around the edges of the floor, keeping the strings taut, it is easy to detect if one portion of the floor's periphery is higher or lower than another.

Having fixed the correct level for the edges of the floor it is not difficult to complete the excavation of the remainder.

— — —

### A PORTABLE DISINFESTOR.

By MAJOR R. BENNETT,

*Royal Army Medical Corps.*

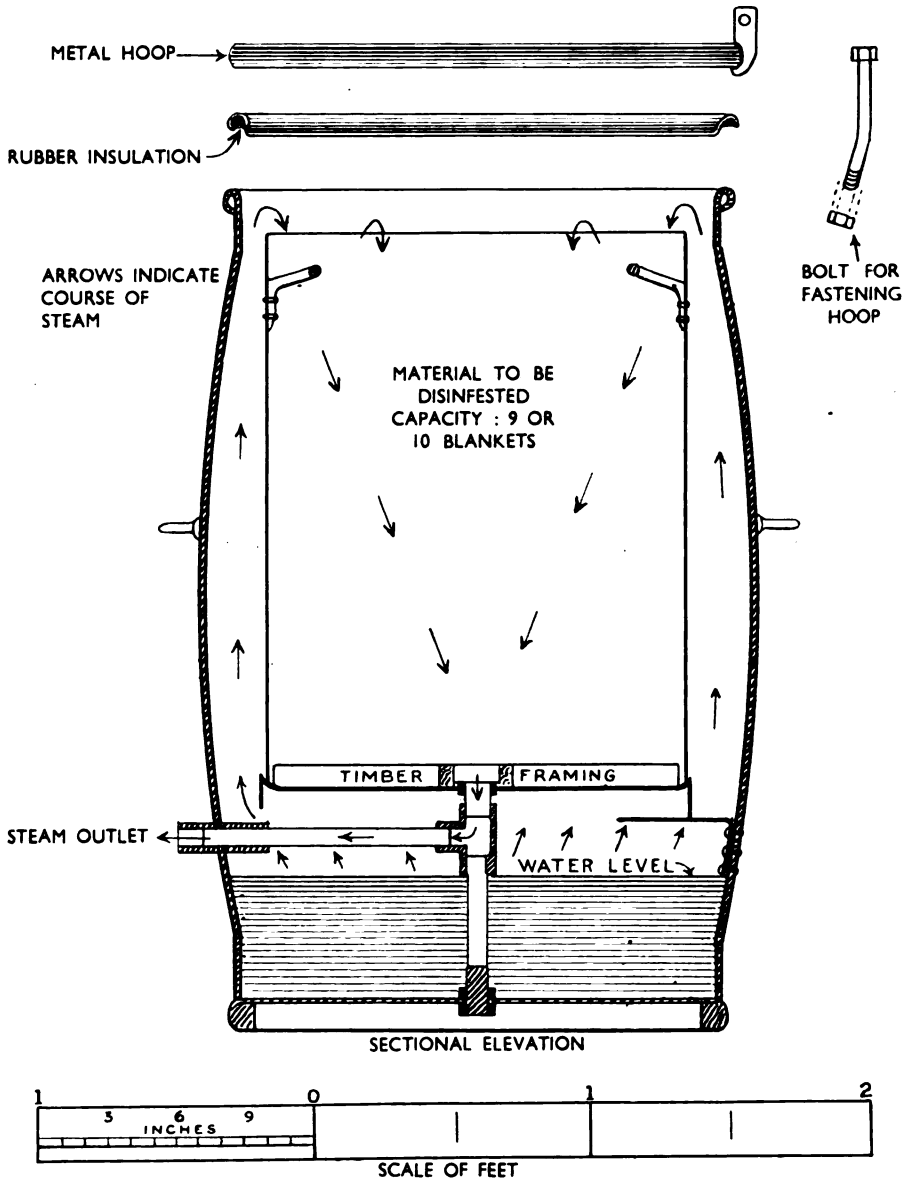
THE old type of Serbian Barrel disinfestor has several drawbacks and an attempt has been made to construct a model of a similar type but of greater efficiency. To be thorough, disinfestation should be carried out by steam under pressure and using the principle of downward displacement.

The disinfestor described here was made from a steel spirit barrel, an ordinary dustbin and some short lengths of water pipe. The spirit barrel was obtained from a paint factory. It is made of galvanized steel and is provided with an airtight lid with rubber washer and a metal hoop for locking the lid. When fixed in position the lid is perfectly steam-tight. The dustbin used was obtained from Ordnance. The handles were removed and fixed on the inside so that the dustbin would slip inside the steel barrel and rest on angle pieces riveted inside the barrel. Holes were drilled in the base of the dustbin and the side of the barrel to take short lengths of iron pipe and the whole made steam-tight. The construction is best understood by referring to the diagram.

In working the disinfestor, water is poured into the barrel to a depth of about six inches. The whole is then placed on a trench fire and the container filled with the blankets or material to be disinfested. The lid is fixed on and made steam-tight. It is found an advantage to insert some sacking under the lid to protect the rubber washer from the steam.



When disinfestation is complete steam is observed coming from the pipe at the side of the barrel and this should be allowed to proceed for ten minutes. The barrel can then be lifted off the fire by the handles and



the lid removed. If the blankets are shaken out immediately they will be found to dry rapidly.

The capacity of the disinfestor is about twenty blankets per hour. It

has been found to work efficiently and a large number of disinfestations have been carried out with it.

The construction of the disinfestor was entirely carried out by men of a Field Hygiene Section. I am particularly indebted to Serjeant Austin, R.A.M.C., for designing and supervising the construction, and to Private Leitch, R.A.M.C., for drawing the scale plan.

---

### A CASE OF INFECTION WITH *FASCIOLA HEPATICA*.

BY MAJOR G. W. B. SHAW,

*Royal Army Medical Corps.*

AND

CAPTAIN A. J. CLYNE,

*Royal Army Medical Corps.*

HUMAN infection with *Fasciola hepatica*, the common liver fluke of the sheep, is a rare condition. Stitt<sup>1</sup> quotes some fifty cases as having been recorded. In the circumstances, the following case is of interest :—

Mrs. R. W., aged 30, the wife of a soldier, reported at the British Military Families Hospital, Poona, on May 6, 1940, complaining of an acute stabbing pain of the right upper abdomen, in the region of the liver, for the past week.

She had been in India for ten years, previous to which she had lived in Switzerland.

Nine months before admission she was in hospital with "bacilluria," and three months later for appendicectomy (diagnosed "chronic appendicitis"). On both occasions the main symptom had been vague abdominal pain, chiefly right sided. Two months ago, she was again in hospital with "pain in the abdomen and back," this time diagnosed "myalgia" after X-ray examination had excluded renal calculus. She had been married six years, with one child, aged 5, and had had no abortions or miscarriages.

When admitted, the patient had a temperature of 99·4° F. and pulse 92. She had a small hard painful nodule over the seventh rib in the right anterior axillary line. This nodule was freely movable with apparently no attachment to the rib. X-ray examination of the spine, ribs, lungs and liver region revealed nothing abnormal. The blood examination was as follows :—

Total W.B.C., 10,800 per c.mm.; total R.B.C., 5,480,000 per c.mm.; Hb., 90 per cent; differential, polymorphs, 76 per cent; lymphocytes, 20 per cent; large monocytes, 2 per cent; eosinophils, 2 per cent.

Stool examination showed nothing abnormal. There were no cysts or ova

---

<sup>1</sup> Stitt, Clough and Clough "Practical Bacteriology, Hæmatology and Animal Parasitology," also Faust in "Human Helminthology" quotes a similar number of cases.

visible. The blood Wassermann was returned W.R. positive + and Kahn negative. This was twice repeated, with the same result.

Because of the Wassermann reaction, the patient was put on a course of potassium iodide and sulphostab injections and the lump on her chest was regarded as possibly a gumma. It however showed no response whatever to the antisyphilitic treatment and three weeks after her admission it was decided to explore the tumour. During this time she had had repeated attacks of pain on the right side of the chest and the lump was very tender. On several occasions she had low evening fever.

An incision over the tumour revealed a mass of inflamed subcutaneous tissue, in the centre of which was a live flat worm. The inflamed mass of tissue was excised and no evidence of any track leading to deeper structures could be found. The operative diagnosis was "an inflammatory swelling due to the presence of a flat worm resembling a liver fluke." Subsequently the fluke was identified at the Southern Command Laboratory as *Fasciola hepatica*.

The patient was kept in hospital a further three weeks during which time two courses of emetine were given. Careful questioning failed to disclose any possible source of infection. Repeated stool examination failed to reveal any ova of *Fasciola hepatica*. She had no further pain and another X-ray of the liver region showed nothing abnormal. She was discharged, to report periodically for observation.

The interesting features of the case were :—

1. What was the extent of her infection with liver fluke ?
2. The migration from the liver through the diaphragm and chest wall to the subcutaneous tissues.
3. The positive Wassermann reaction which, in the absence of any history or clinical signs suggesting syphilis, appeared to be due to the fluke infection. The negative Kahn supports this view.

We are indebted to Lieutenant-Colonel A. C. Craighead, I.M.S., for the laboratory examinations, and to Colonel W. L. E. Fretz, the Officer Commanding, Connaught Military Hospital, Poona, for his permission to forward these notes for publication.

---

### THE DOCTOR'S BAG.

By MAJOR E. A. SMYTH,  
*Royal Army Medical Corps.*

DURING my experience for short periods as locum tenens in ten different general practices in various parts of the British Isles, and as medical officer in charge of families in the Army, I came to the conclusion that few doctors pay much attention to the design and equipment of their "doctor's bag."

A good bag should be : (1) Simple and strong ; (2) of reasonable size and weight, enabling it to be easily carried ; (3) divided into convenient

compartments from which equipment can be quickly removed and replaced ; (4) capable of being quickly rearranged to take different types of equipment ; (5) capable of easy cleaning ; and (6) of smart appearance.

Before describing a type of doctor's bag which I think fulfils the above conditions reasonably well, I wish to discuss a few general points concerning the equipment of a bag suitable for general practice.

I consider a vaginal speculum should be included, as the patient's home is a very suitable place to carry out such examinations. If it is carried as a routine, one will get into the habit of using it more often than appears to be general. As regards types of speculum, I find the Casco's type much superior to any other for use in general practice.

In the usual type of general practice, it is wise to carry two throat swabs as a routine. This I feel will often mean the earlier diagnosis of acute serious conditions of the throat, eye, etc. For instance, when seeing a "doubtful throat case," there seems to be an unconscious tendency to consider the case unlikely to be diphtheria, if without a throat swab. If a throat swab is conveniently available it will be used, affording great peace of mind and protection for both the patient and the doctor.

The bag would be equipped still more efficiently if it contained a couple of blood slides, enabling a smear to be made from throat, eye, urethra, cervix, etc. In many cases the swab has dried and is of little or no value by the time it reaches the pathological laboratory, whereas a smear will remain good for days.

I recommend the carrying of an electric auriscope. In many cases the auriscope will be of little value owing to wax in the meatus or the presence of a discharge. So one should really also carry a small ear syringe, or at least a silver probe on which a little cotton-wool can be applied, or special wooden "probes." Many different types of auriscopes, usually in the form of combined auriscope and ophthalmoscope, are on sale. Most of these auriscopes have the bulb situated in the part to which the speculum is attached. Practically all these instruments give a bright dazzling light, and consequently an unsatisfactory view of the tympanic membrane. The best electric auriscope I have seen is the Rayner type. It is a combined auriscope and ophthalmoscope. The bulb is in the handle, just at the top of the battery, and the light is reflected into the speculum by a system of mirrors, giving an excellent view of the tympanic membrane. The ophthalmoscope is equally good. Many firms produce cases containing ophthalmoscope, auriscope, nasal speculum, spatula, etc., but I find the extras, i.e. nasal speculum, spatula, etc., of little value.

In China I have had the opportunity of being able to experiment with different types of bags much more cheaply than would be the case in England. As a result of these experiments I have produced a bag which I hope may be of use to some general practitioners and officers of the Royal Army Medical Corps.

The bag is capable of carrying, when fully packed, enough equipment to deal with most conditions (excluding major surgery) in general practice.

For normal routine visits, when the equipment is reduced, it becomes a reasonable bag as regards weight, size, and shape for carrying short distances. It is capable of carrying a pair of obstetrical forceps enabling it occasionally to be used as a combined midwifery and general bag.

Roughly the bag is as follows : An oblong five-ply wood box, 17 inches long,  $7\frac{1}{2}$  inches high, and  $6\frac{3}{4}$  inches broad, these being the outside measurements. Inside the box has three trays, numbered One, Two, and Three. It opens by a lid on the top, and on opening the lid one sees Tray No. 1, which, when equipped, appears as in the following photograph (fig. 1).



FIG. 1.—At the back can be seen small compartments for thermometer, blood slides, tape measure, etc. In front, black case (containing auriscope and ophthalmoscope) and stethoscope, torch, etc.

The small compartments at the back, holding thermometer, blood slides, and tape measure, consist of one long tray (1A) divided into three compartments.

This small tray is inside Tray No. 1 and lifts out of the latter, leaving underneath a similar tray (1B) which is divided into two compartments, each containing a throat swab. This tray also lifts out of the No. 1 tray so that these two small long trays lie one on top of the other inside Tray No. 1. They are kept in position by a ledge of wood attached to the inside of each end piece of Tray No. 1.

Tray No. 1 (including the two small trays just described, which fit inside it) is made of five-ply wood.

The inside measurements of Tray No. 1 are 16 inches long,  $5\frac{3}{4}$  inches broad, and  $2\frac{1}{4}$  inches deep. The inside measurements of the bottom small tray (1B) are  $15\frac{1}{2}$  inches long, 1 inch broad, and 1 inch deep. The inside of this tray (1B) is divided into two equal parts by a partition in the centre, making each compartment with inside measurements of approximately  $7\frac{5}{8}$  by 1 by 1 inch, which is a convenient size for holding a throat swab.

The inside measurements of the top small tray (1A) are  $15\frac{1}{2}$  by 1 by  $\frac{3}{4}$  inches and this is divided into three compartments of (1)  $7\frac{1}{2}$  by 1 by  $\frac{3}{4}$  inches (for thermometer and pencil); (2)  $3\frac{3}{4}$  by 1 by  $\frac{3}{4}$  inch (for four or five blood slides); and (3) also  $3\frac{3}{4}$  by 1 by  $\frac{3}{4}$  inches for any small extras such as a roll of measuring tape, spare key of bag, etc.

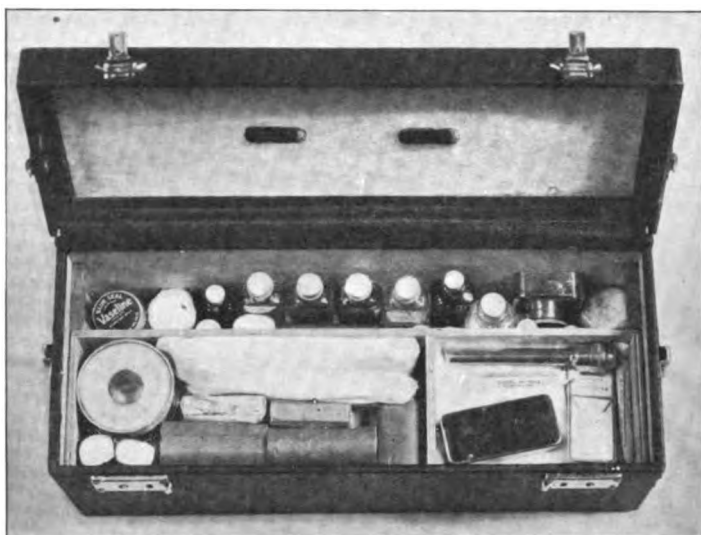


FIG. 2.—Tray No. 1 has been removed. Compartment 2A contains dressings. Compartment 2B contains syringe, suture material, and needles, etc. The bottle compartment is now clearly visible.

When the two small trays (1A and 1B) are in position inside Tray No. 1, the space left in the big tray No. 1 is 16 by  $4\frac{1}{4}$  by  $2\frac{1}{4}$  inches. This space conveniently holds a case containing a Rayner's combined auriscope and ophthalmoscope, leaving sufficient space for stethoscope, torch, prescription book and spatula, or packet of wooden spatulas.

If more room is needed, as in the case of a different model ophthalmoscope and auriscope, then the two small trays (1A and 1B) can be removed from Tray No. 1, and the swabs, slides, etc., kept in the bottle compartment, to be described later, or carry the ophthalmoscope and auriscope without their case, thereby allowing the small trays to remain inside Tray No. 1.

The general idea of the arrangement and equipment of the top tray (No. 1)

visible. The blood Wassermann was returned W.R. positive + and Kahn negative. This was twice repeated, with the same result.

Because of the Wassermann reaction, the patient was put on a course of potassium iodide and sulphostab injections and the lump on her chest was regarded as possibly a gumma. It however showed no response whatever to the antisyphilitic treatment and three weeks after her admission it was decided to explore the tumour. During this time she had had repeated attacks of pain on the right side of the chest and the lump was very tender. On several occasions she had low evening fever.

An incision over the tumour revealed a mass of inflamed subcutaneous tissue, in the centre of which was a live flat worm. The inflamed mass of tissue was excised and no evidence of any track leading to deeper structures could be found. The operative diagnosis was "an inflammatory swelling due to the presence of a flat worm resembling a liver fluke." Subsequently the fluke was identified at the Southern Command Laboratory as *Fasciola hepatica*.

The patient was kept in hospital a further three weeks during which time two courses of emetine were given. Careful questioning failed to disclose any possible source of infection. Repeated stool examination failed to reveal any ova of *Fasciola hepatica*. She had no further pain and another X-ray of the liver region showed nothing abnormal. She was discharged, to report periodically for observation.

The interesting features of the case were :—

1. What was the extent of her infection with liver fluke ?
2. The migration from the liver through the diaphragm and chest wall to the subcutaneous tissues.
3. The positive Wassermann reaction which, in the absence of any history or clinical signs suggesting syphilis, appeared to be due to the fluke infection. The negative Kahn supports this view.

We are indebted to Lieutenant-Colonel A. C. Craighead, I.M.S., for the laboratory examinations, and to Colonel W. L. E. Fretz, the Officer Commanding, Connaught Military Hospital, Poona, for his permission to forward these notes for publication.

---

#### THE DOCTOR'S BAG.

BY MAJOR E. A. SMYTH,  
*Royal Army Medical Corps.*

DURING my experience for short periods as locum tenens in ten different general practices in various parts of the British Isles, and as medical officer in charge of families in the Army, I came to the conclusion that few doctors pay much attention to the design and equipment of their "doctor's bag."

A good bag should be : (1) Simple and strong ; (2) of reasonable size and weight, enabling it to be easily carried ; (3) divided into convenient

compartments from which equipment can be quickly removed and replaced ; (4) capable of being quickly rearranged to take different types of equipment ; (5) capable of easy cleaning ; and (6) of smart appearance.

Before describing a type of doctor's bag which I think fulfils the above conditions reasonably well, I wish to discuss a few general points concerning the equipment of a bag suitable for general practice.

I consider a vaginal speculum should be included, as the patient's home is a very suitable place to carry out such examinations. If it is carried as a routine, one will get into the habit of using it more often than appears to be general. As regards types of speculum, I find the Casco's type much superior to any other for use in general practice.

In the usual type of general practice, it is wise to carry two throat swabs as a routine. This I feel will often mean the earlier diagnosis of acute serious conditions of the throat, eye, etc. For instance, when seeing a "doubtful throat case," there seems to be an unconscious tendency to consider the case unlikely to be diphtheria, if without a throat swab. If a throat swab is conveniently available it will be used, affording great peace of mind and protection for both the patient and the doctor.

The bag would be equipped still more efficiently if it contained a couple of blood slides, enabling a smear to be made from throat, eye, urethra, cervix, etc. In many cases the swab has dried and is of little or no value by the time it reaches the pathological laboratory, whereas a smear will remain good for days.

I recommend the carrying of an electric auriscope. In many cases the auriscope will be of little value owing to wax in the meatus or the presence of a discharge. So one should really also carry a small ear syringe, or at least a silver probe on which a little cotton-wool can be applied, or special wooden "probes." Many different types of auriscopes, usually in the form of combined auriscope and ophthalmoscope, are on sale. Most of these auriscopes have the bulb situated in the part to which the speculum is attached. Practically all these instruments give a bright dazzling light, and consequently an unsatisfactory view of the tympanic membrane. The best electric auriscope I have seen is the Rayner type. It is a combined auriscope and ophthalmoscope. The bulb is in the handle, just at the top of the battery, and the light is reflected into the speculum by a system of mirrors, giving an excellent view of the tympanic membrane. The ophthalmoscope is equally good. Many firms produce cases containing ophthalmoscope, auriscope, nasal speculum, spatula, etc., but I find the extras, i.e. nasal speculum, spatula, etc., of little value.

In China I have had the opportunity of being able to experiment with different types of bags much more cheaply than would be the case in England. As a result of these experiments I have produced a bag which I hope may be of use to some general practitioners and officers of the Royal Army Medical Corps.



The bag is capable of carrying, when fully packed, enough equipment to deal with most conditions (excluding major surgery) in general practice.

For normal routine visits, when the equipment is reduced, it becomes a reasonable bag as regards weight, size, and shape for carrying short distances. It is capable of carrying a pair of obstetrical forceps enabling it occasionally to be used as a combined midwifery and general bag.

Roughly the bag is as follows: An oblong five-ply wood box, 17 inches long,  $7\frac{1}{2}$  inches high, and  $6\frac{3}{4}$  inches broad, these being the outside measurements. Inside the box has three trays, numbered One, Two, and Three. It opens by a lid on the top, and on opening the lid one sees Tray No. 1, which, when equipped, appears as in the following photograph (fig. 1).



FIG. 1.—At the back can be seen small compartments for thermometer, blood slides, tape measure, etc. In front, black case (containing auriscope and ophthalmoscope) and stethoscope, torch, etc.

The small compartments at the back, holding thermometer, blood slides, and tape measure, consist of one long tray (1A) divided into three compartments.

This small tray is inside Tray No. 1 and lifts out of the latter, leaving underneath a similar tray (1B) which is divided into two compartments, each containing a throat swab. This tray also lifts out of the No. 1 tray so that these two small long trays lie one on top of the other inside Tray No. 1. They are kept in position by a ledge of wood attached to the inside of each end piece of Tray No. 1.

Tray No. 1 (including the two small trays just described, which fit inside it) is made of five-ply wood.

The inside measurements of Tray No. 1 are 16 inches long,  $5\frac{3}{4}$  inches broad, and  $2\frac{1}{4}$  inches deep. The inside measurements of the bottom small tray (1B) are  $15\frac{1}{2}$  inches long, 1 inch broad, and 1 inch deep. The inside of this tray (1B) is divided into two equal parts by a partition in the centre, making each compartment with inside measurements of approximately  $7\frac{1}{2}$  by 1 by 1 inch, which is a convenient size for holding a throat swab.

The inside measurements of the top small tray (1A) are  $15\frac{1}{2}$  by 1 by  $\frac{3}{4}$  inches and this is divided into three compartments of (1)  $7\frac{1}{2}$  by 1 by  $\frac{3}{4}$  inches (for thermometer and pencil); (2)  $3\frac{3}{4}$  by 1 by  $\frac{3}{4}$  inch (for four or five blood slides); and (3) also  $3\frac{3}{4}$  by 1 by  $\frac{3}{4}$  inches for any small extras such as a roll of measuring tape, spare key of bag, etc.

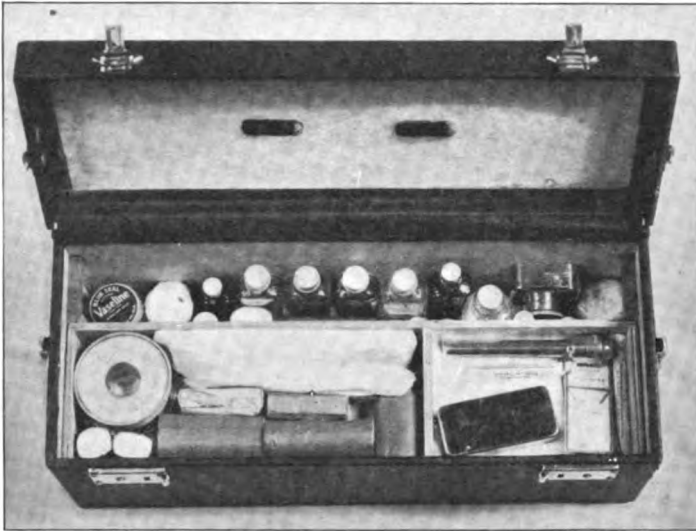


FIG. 2.—Tray No. 1 has been removed. Compartment 2A contains dressings. Compartment 2B contains syringe, suture material, and needles, etc. The bottle compartment is now clearly visible.

When the two small trays (1A and 1B) are in position inside Tray No. 1, the space left in the big tray No. 1 is 16 by  $4\frac{1}{4}$  by  $2\frac{1}{4}$  inches. This space conveniently holds a case containing a Rayner's combined auriscope and ophthalmoscope, leaving sufficient space for stethoscope, torch, prescription book and spatula, or packet of wooden spatulas.

If more room is needed, as in the case of a different model ophthalmoscope and auriscope, then the two small trays (1A and 1B) can be removed from Tray No. 1, and the swabs, slides, etc., kept in the bottle compartment, to be described later, or carry the ophthalmoscope and auriscope without their case, thereby allowing the small trays to remain inside Tray No. 1.

The general idea of the arrangement and equipment of the top tray (No. 1)

is that in most general practices 50 to 70 per cent of the patients can be examined during a tour of visits without going beyond the top tray.

On removing the top tray (No. 1) from the bag, Tray No. 2 (which lies immediately under Tray No. 1) comes into view. The inside measurements of Tray No. 2 are 16 by  $3\frac{7}{8}$  by  $1\frac{1}{2}$  inches, this space being divided into two unequal compartments, 2A and 2B. Compartment 2A measures (inside)  $10\frac{1}{4}$  by  $3\frac{7}{8}$  by  $1\frac{1}{2}$  inches, and Compartment 2B measures (inside)  $5\frac{1}{2}$  by  $3\frac{7}{8}$  by  $1\frac{1}{2}$  inches.

The larger compartment (2A) is intended for dressings. It will hold approximately the following: 2 3-inch bandages, 1 2-inch bandage, 2 1-inch bandages, small roll of lint, 1 10-yard roll of 1-inch adhesive strapping, 2 or 3 small packets of Parke Davis compressed sterile cotton wool, several elastoplast "patch" dressings.

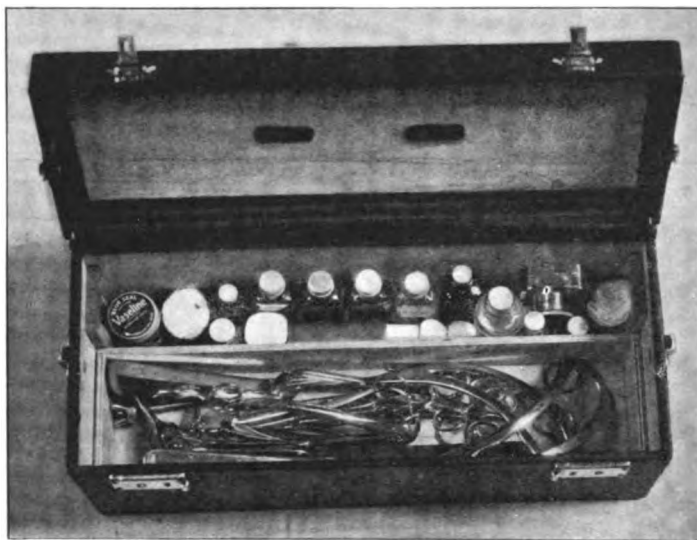


FIG. 3.—Trays No. 1 and No. 2 having been removed, shows Tray No. 3 full of instruments.

The smaller compartment will conveniently hold approximately the following equipment: 1 1-c.c. syringe, or case of combined 1-c.c. and 10-c.c. syringes, phials of dangerous drugs, ampoule of pituitrin, ampoule of coramine, ampoules of anti-tetanic serums, ampoule of anti-diphtheritic serum, few suture needles, 1 tube catgut, 1 tube silkworm gut.

Tray No. 2 is also made of five-ply wood. Dressings, syringes, dangerous drugs, etc., can be quickly found and removed and replaced without any meticulous packing. It also allows for great variation in the quantity and types of equipment and dressings carried.

Tray No. 2 lifts out as easily as No. 1 Tray, bringing Tray No. 3 immediately into view, as all three trays lie one on top of the other. Tray No. 3, or bottom tray, measures (inside) 16 by  $3\frac{7}{8}$  by  $2\frac{1}{2}$  inches.

This tray consists of one long narrow compartment which is capable of holding approximately the following equipment : Several artery forceps, case of scalpels, dissecting forceps, scissors, needle holder, small ear syringe, obstetrical forceps, a folding open anæsthetic mask frame, Casco's vaginal speculum, volsellum, silver probe, rubber gloves, catheters, a few small extras.

This tray can be made of five-ply wood. If made of enamel or aluminium all the instruments, gloves, etc., that it may contain can be quickly sterilized in cases of urgency by filling the tray with an antiseptic solution such as dettol.

As both Tray No. 2 and Tray No. 3 are each  $3\frac{1}{4}$  inches wide (inside) or  $4\frac{1}{4}$  inches (approximately) outside, they will lie accurately one on top of the other (inter-changeable). As the inside measurements of the empty bag without trays is  $16\frac{1}{2}$  by 7 by  $6\frac{1}{4}$  inches, it can be easily seen there will be a long narrow space left between Trays No. 2 and No. 3 and one side of the bag. This space will measure approximately  $16\frac{1}{2}$  inches long, 2 inches wide, and  $4\frac{1}{2}$  inches deep. This space is intended chiefly for bottles.

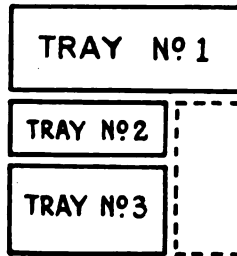


Diagram of the trays lying as they would when inside the bag. A space shown enclosed by dotted lines will then exist between the trays and the inside of the bag. This space is the bottle compartment.

After removal of the top tray, this space will be exposed and any bottle or other equipment it may contain can be quickly removed and replaced. The bottle compartment will take nearly any shape of bottle which is not more than  $4\frac{1}{2}$  inches tall. When completely filled with bottles, they pack firmly. If only a couple of bottles are carried they can be secured in position by filling the remainder of the space with about a  $\frac{1}{4}$  lb. of a standard length roll of cotton-wool, or bandages standing vertically, as shown in fig. 3.

If desired, this compartment can be easily converted into a number of small compartments to take standard-sized bottles. Personally I prefer to leave the compartment unaltered so that it is adaptable to take bottles, test tubes, ethyl chloride, spirit lamp, etc.

The bottle compartment, when full, is capable of holding approximately the following equipment : Bottle of iodine ; bottle of surgical spirit ; bottle of concentrated antiseptic, e.g. dettol ; bottle of chloroform or ether, or one of each ; small jar of concentrated antiseptic tablets ; small jar of vaseline :

small bottle of Benedict's or Fehling's solution ; small bottle of acetic acid ; a couple of test tubes in a case ; a spirit lamp, if of small pattern, or the flat metal type ; a bottle of local anæsthetic ; an ethyl chloride container ; a few small extras.

Trays Nos. 2 and 3 are kept in position in the bag by a small ledge of wood, attached to each end piece of the bag. A portion of this ledge can be seen adjacent to jar marked "vaseline" in fig. 3.

This ledge is made of a piece of wood about  $\frac{1}{2}$  inch in breadth and thickness. It is screwed on to each end piece of the bag and consists of a vertical portion and a horizontal portion.

The vertical portion keeps the Trays Nos. 2 and 3 in position, thereby allowing the bottle compartment to exist. The horizontal portion prevents the top tray (No. 1) from descending into the bag further than approximately half the depth of the tray. The upper half of Tray No. 1 therefore projects above the edge of the open bag as shown in fig. 1. This idea allows the top tray to be removed and replaced more quickly. The ledge also helps to secure Tray No. 1 and allows the bag to be used with only the No. 1 Tray, the No. 2, or the No. 3 Trays, or both trays being excluded altogether from the bag. If Trays Nos. 2 and 3 are not in use, the whole space under Tray No. 1 can be arranged to one's own personal requirements.

When all three trays are removed, the bag is then an empty box except for the small ledge projecting  $\frac{1}{2}$  inch from each end piece. The bag and all its trays are therefore easily cleaned.

The inside measurements of the empty bag are  $16\frac{1}{2}$  by  $6\frac{1}{4}$  by 7 inches deep. Of the 7 inches in depth, approximately  $1\frac{1}{4}$  inches of this is included in the lid.

The inside of the bag and the trays are unlined, which I find excellent for cleaning and rough wear.

The bag is covered with thin good quality black synthetic leather. The lid is attached by three small strong hinges. It has two locks in front, and a metal clip catch at each end to relieve the strain on the hinges and locks. A strong leather handle is fitted to the lid.

The measurements I have given are not sufficiently accurate for the bag to be constructed without due care. I suggest that the trays be constructed first, and then the bag, in the form of a five-ply wood box, made to take the trays accurately. The projecting ledge is then fitted to the inside of each end piece of the bag in such a way as to keep Trays Nos. 2 and 3 in position and yet allowing them to slide up and down freely, during removal and replacement. Finally the outside of this "box bag" is covered with thin synthetic leather, and hinges, locks, catches, and handle fitted.

I have previously stated that this bag is of reasonable size and of smart appearance, but it is naturally heavy when containing all the equipment I have mentioned it to be capable of carrying. No general practitioner normally wishes to carry such a large amount of equipment. The general idea of this bag is : (1) That it can when necessary carry more or less all

the equipment that any general practitioner is likely to need ; and (2) that it becomes, when containing just the necessities of a normal tour of visits, a small and relatively light bag capable of having its equipment rapidly augmented.

There are many ways in which this bag can be easily altered to suit personal requirements. Many doctors may prefer a bag made of aluminium instead of wood. This bag should be suitable for the country general practitioner or officers of the Royal Army Medical Corps in charge of families.

Finally, if any of my readers like the design of the bag, but require a smaller and lighter type, then I recommend a bag with the following approximate measurements.

Tray No. 1 inside measurements : 12 by  $4\frac{7}{8}$  by 2 inches. Small trays 1A and 1B are fitted at one end instead of the back.

The inside measurements of top small tray (1A) are  $4\frac{3}{8}$  inches long by 1 inch wide by  $\frac{3}{4}$  inch deep, for blood slides, tape measure, etc. The bottom small tray (1B) of same size for thermometer and pencil, etc.

Tray No. 2 inside measurements : 12 by  $3\frac{7}{8}$  by  $1\frac{3}{4}$  inches deep, and divided into two compartments (2A),  $8\frac{1}{4}$  by  $3\frac{7}{8}$  by  $1\frac{3}{4}$  inches, and (2B),  $3\frac{1}{2}$  by  $3\frac{7}{8}$  by  $1\frac{3}{4}$  inches.

Tray No. 3 inside measurements : 12 by  $3\frac{7}{8}$  by  $1\frac{1}{2}$  inches. This tray is one long compartment, and if made of enamel or aluminium can be used as a sterilizer.

When a bag is constructed to hold these trays, the bottle compartment will measure  $12\frac{1}{2}$  inches long, 1 inch wide, and  $3\frac{3}{4}$  inches deep.

I suggest that equipment be arranged in this bag as follows:—

*Tray No. 1.*—Stethoscope, torch, thermometer, blood slides, spatula, auriscope (without case), and prescription book.

*Tray No. 2, Compartment 2A.*—Casco's vaginal speculum, scissors, artery forceps, scalpel, dissecting forceps, probe, and a pair of rubber gloves.

*Tray No. 2, Compartment 2B.*—1 c.c. syringe, few phials of dangerous drugs, and a few suture needles and suture material.

*Tray No. 3.*—Dressings and bandages, etc.

*Bottle Compartment.*—Two throat swabs (each in case), small bottles of iodine surgical spirit, concentrated antiseptic tablets, aspirin, cascara, and a small box of vaseline.

The outside measurements of the finished bag will be roughly 13 inches long,  $5\frac{7}{8}$  inches broad, and  $6\frac{1}{2}$  inches in height.

This bag will probably be more suitable for the general practitioner with a town practice and the majority of officers of the Royal Army Medical Corps.

My thanks are due to Lieutenant-Colonel C. F. Burton, M.C., R.A.M.C., Officer Commanding British Military Hospital, Shanghai, for permission to submit this article for publication and for helpful criticisms, and to Mr. R. V. Dent, of the Henry Lester Institute, Shanghai, for his excellent photographs.

## Current Literature.

FALLON, M. Lung Injury in the Intact Thorax, with Report of a Case.  
*Brit. J. Surgery.* 1940, July, v. 28, 39-49. [Numerous refs.]

This paper is not concerned with war injuries but calls attention to the important fact that the lung may be seriously damaged by accidents which do not apparently damage the chest wall or the parietal pleura.

The author describes a case which occurred in his own practice. It was that of a medical student who was boxing and who lost his fight after being "down" on several occasions. His symptoms were delayed in onset but he developed pain in the chest and hæmoptysis, and an X-ray showed a cavity in the lower lobe of the left lung with a fluid level. The condition resolved spontaneously.

The mechanism by which these injuries are produced is not known and various theories are discussed. Limón, Pera, Séjour and others consider that the lung, which is filled with air at the time, is compressed and bursts like an inflated paper bag because the air cannot escape quickly enough through the upper air passages. Spasm of the glottis would of course favour such a state of affairs. The morbid anatomy of the injuries varies considerably, but, for purposes of convenience, Lamballe describes three grades of lung damage :—

(1) A simple tear of the capillaries with the production of ecchymosis (often in the form of sub-pleural hæmorrhages).

(2) More important vessels torn with real effusion of blood.

(3) The lung is reduced to pulp in places and there are lesions of the larger bronchi and blood vessels.

The hæmorrhage may be massive and confined to one lobe, and Sauerbruch records a patient who developed gangrene and a putrid empyema. It may be generalized in both lungs, or it may be small, peripheral and circumscribed like the case described by Lilienthal.

Diagnosis is difficult but is usually suggested by the X-ray appearances—which have been carefully described by Santé—a history of recent trauma, and the presence of some or all of the following signs and symptoms, cough, dyspnoea, hæmoptysis and surgical emphysema. The condition often exists in association with hæmothorax, pneumothorax and atelectasis. Lockwood, who had considerable experience of chest wounds in the last war, was impressed by the constancy of hæmothorax in injuries of this type, although he states that at operation one seldom observes bleeding from a contused lung.

As regards treatment Sauerbruch speaks as follows: "No patient must be allowed to die from progressive internal hæmorrhage, nor must the mechanical effects of a pneumothorax continue to threaten respiratory and cardio-vascular function. Otherwise operation is rarely necessary."

[This paper is concerned only with injuries to the lung, but it may be well to state that there are recorded cases of injuries to the heart, the pericardium and the œsophagus occurring in patients whose chest walls were intact. In war surgery such injuries may be produced by blast or crushing and also by missiles which have entered another part of the body and finally lodged in one of the thoracic viscera. Note also that an injury to one side of the chest may result in damage to the other side.]

N. R. BARRETT.

*Reprinted from "Bulletin of War Medicine," November, 1940.*

GOLDHAHN, R. Erfrierungen. [**Frost-bite.**] *Deut. med. Woch.* 1940, Jan. 19, v. 66, No. 3, 58-61.

A brief review of prevention and treatment of frost-bite. For the proper handling of frost-bite it is necessary to recognize not only the three degrees of local change—which roughly correspond with those of burning—but also the more widespread disturbance of the vascular system and its autonomic nerves which leads to vasoconstriction. The purely local effect of cold is not in itself so very important; of chief importance are all those factors which lead to a general reduction of the peripheral circulation and thus aid local cold to produce frost-bite—for example, tight boots, constricting leggings and more general factors such as immobility and disease.

Frost-bite is prevented by diminishing heat loss by means of non-conducting clothing and the avoidance of all factors reducing blood flow. A practical difficulty is that the stouter the boots the more readily local constriction occurs. Since poor heat conductors lose their property by becoming wet, boots should be well greased. Waterproof materials increase the secretion and accumulation of sweat and so lead to dampness. Sweating feet should be treated by frequent baths and the application of formalin (10 per cent solution or 20 per cent formol vaseline). Frequent changes of footwear are important but difficult to ensure under war conditions. It should be remembered that the change from thin summer to thick winter socks may render a well-fitting boot too tight. The best footwear is hide with fur inside.

Continued movement is necessary to promote local blood flow. If duties involve immobility, reliefs should be more frequent. Small doses of alcohol should be used only when exposure to cold is brief, and the men can return to warmed rooms. Large doses of alcohol are dangerous in severe weather, leading to fatigue, lack of movement and vasomotor paralysis and thus to increased heat loss.

In the treatment of frost-bite, the usually stressed need for careful transport to avoid breaking frozen limbs is not important. Frozen fingers and ears may break like glass, but the freezing of whole limbs to this extent indicates imminent death.

Patients should be brought into an unheated room and gradually warmed. The frozen part may be rubbed with snow; cold towels may be applied



and followed by gentle friction. Immersion in a cold and gradually warmed bath is also suitable. After thawing, the skin is dried and powdered.

If digits become blue and swollen by the extravasation of blood, deep incisions are recommended. Partial elevation promotes the venous return. Bier's passive congestion to promote hyperæmia is not suitable, as it succeeds only with a normal vascular system. In the absence of gangrene, the frost-bite may be treated by alternate hot and cold baths repeated night and morning. The water should be as cold and as hot as can be tolerated and the limb immersed in the cold for only 5 seconds and in the warm for 2 minutes. Oak bark may be added to the water. If necrosis has occurred the part must be kept dry to avoid moist gangrene. With gangrene there is also a persistent, cyanotic œdema of the neighbouring parts which interferes with healing. So far as possible the vasoconstriction must be relieved by vasodilator remedies. Padutin may be used but its effect is uncertain and may be delayed.\* More rapid vasodilatation may be ensured by nerve or spinal anæsthesia or by sympathectomy. Spinal anæsthesia is advised for the lower limbs.

R. T. GRANT.

*Reprinted from "Bulletin of War Medicine," November, 1940.*

---

## Reviews.

---

THE NEUROSES IN WAR. By Several Authors. Edited by Dr. Emanuel Miller (now Major, R.A.M.C.). London: Macmillan & Co. 1940. Pp. xii + 250. Price 10s. 6d.

Psychological disorders tend to be something of a puzzle to the average medical man, since medical training in past years was unable to keep pace with the development of knowledge in this field. This volume, by a group of authors, most of whom have practical experience of psychological problems dating back to the war of 1914, attempts to summarize accepted diagnosis and therapeutic knowledge in relation to neuroses. It should be of the greatest value.

The opening chapter, with a subsequent bibliography, gives a survey of the best-known British, American, French and German publications on the neuroses of war. Three following chapters are on the mode of onset of neuroses and on the varied way in which these disorders may first present themselves to the regimental medical officer. The next three chapters deal with the clinical types, differential diagnosis and psychopathological background of this group of disorders, and attention is paid to such topics as the physiological disturbances of emotional origin popularly known nowadays as psycho-somatic disorders, and the differential diagnosis between various "organic" disorders that present psychological symptoms and true neurosis.

---

\* [According to Martindale's *Extra Pharmacopœia*, padutin is a preparation of a vasomotor hormone from the pancreas. It may be given either orally or by intramuscular injection for Raynaud's disease and conditions associated with angiospasm.—Ed.]

Treatment is dealt with in the next three chapters, of which the first contains a dramatic description of the work of an advance psychiatric centre which attempted to treat neuroses behind the front line in the last war. It is followed by detailed description of the use of suggestion and hypnotic analysis—a method which proved particularly valuable in dealing with the more acute emotional disturbances found on active service. The third treatment chapter deals with the general approach to a patient with neurosis, and describes the general principles of psychotherapy. The manual proper concludes with a historical survey of psychiatric services as developed in different European armies, with some observation on the applicability of these principles to current problems. There is an interesting discussion on the nature of, and differences between, civilian and military morale, and lastly, a summarizing chapter which attempts to draw general conclusions. The important appendices contain the gist of the report of the War Office Committee of Enquiry on Shellshock (1922), a description of the E.M.S. treatment facilities for civilian psychoneurotic casualties, a classification of psychological disorders commonly found in war and an epitome of psychiatric pharmacology, including the use of evipan. There is a bibliography of over two hundred items and an index.

The volume seems to have avoided, to a rather unexpected extent, the difficulties implicit in multiple authorship, though the editing and proof reading will be improved in a second edition. It is written with a minimum of technical language, and, although there can be little question that some parts of it might be extensively elaborated in the light of more recent knowledge, it seems to fulfil its purpose of introducing the average medical officer to a field of medicine where guidance is not easily obtained. Few will think their half guinea ill spent on this book which might well be a work of reference for all medical units.

THE ANATOMY OF THE EYE AND ORBIT. 2nd edition. By Eugene Wolff, M.B., B.S.Lond., F.R.C.S.Eng. London: H. K. Lewis & Co., Ltd. 1940. Pp. x + 374. Price 31s. 6d.

This work on the anatomy of the eye and orbit has now become well known as providing in a simple and concise form the essentials on the structure, development and phylogeny of the eye, its adnexa and its central nervous connections. In the second edition, which has now appeared, little change has been made in the text apart from the section on the blood-supply of the visual pathway, which has been re-written to embody the author's valuable original observations: as in the previous edition, not the least of its merits are the many references to points of medical and surgical importance which depend on anatomical features. The greatest value of the work, however, lies in its illustrations which are liberal in number, excellent in quality and extremely informative in design. In this second edition some sixty have been added, the great majority of which have either been drawn by the author or prepared from his microscopic

sections. Some of these are excellent, of particular interest being the preparations of the retina. The appeal of a monograph of this type is, of course, restricted ; but for the student and specialist it is unique in English literature.

S. D. E.

**THE PSYCHOLOGY OF FEAR AND COURAGE.** By Edward Glover. Penguin Books, Ltd. 1940. Pp.128.

This booklet, produced mainly from material for broadcasting by the B.B.C., is written in language understandable by the layman not versed in the science of the psychology of fear and courage.

The common-sense lines taken up by the author should do much to allay the fears of any interested reader in these times of stress.

**INJURIES OF THE JAWS AND FACE**, with special Reference to War Casualties. By W. Warwick James, *O.B.E.*, *F.R.C.S.*, *L.D.S.Eng.*, and B. W. Fickling, *F.R.C.S.*, *L.D.S.Eng.* London: John Bale & Staples Limited. 1940. Pp. xi + 200. 194 Illustrations. Price 15s., postage 6d. extra.

Ever since the war clouds burst over Europe, dental officers of the fighting and emergency medical services have wished for an up-to-date reference book on war injuries of the jaws, written from the essentially dental aspect by an author of extensive experience. The available literature on the subject, dating mainly to the last war, is limited, scattered and not readily accessible, while the valuable Report of the Army Advisory Standing Committee on Maxillo-Facial Injuries (1934) is confined by terms of reference to a brief outline of general principles. This book is, therefore, most opportune, and the authors are to be thanked for this concise, practical guide, which should be studied by every dental officer, and, with advantage, by all medical officers. It was a major dental tragedy of the Great War that the authorities, with the lapse of time, ultimately destroyed the case histories, radiographs and photographs of the thousands of jaw cases treated at the various home hospitals when these closed down, and it was a happy thought of Mr. James to preserve for future study some odds and ends of material of his cases at the Third London General Hospital, for the book is mainly based on his collection. Only those who have attempted to piece together disconnected notes, radiographs, models and appliances, frequently without identification and date, can truly appreciate the labour and patience required, and the several months taken for the analysis of the material and preparation of the book are readily understood. Starting with organization, the specialized nature of the injuries and the necessity for trained particular teams to deal with them at the outset are stressed. The significant anatomical features which influence the character of the injury, its diagnosis and treatment, physiology of bone repair, radiographic technique and interpretation, are next considered, followed by the impact effects of missiles on the soft and hard tissues, with the types of wounds produced, a thorough

understanding of which is essential for successful treatment. The bulk of the book is then given to emergency, preliminary and special treatments, so extensively illustrated and lucidly described that the whole sequence from time of wound is easily followed, and these will be the chapters most closely studied. So wide a field permits of much variation in operative and prosthetic procedure and techniques favoured by the authors are given due prominence, though the alternatives are also considered. Eyelet interdental wiring is recommended whenever possible, and there is no doubt it is coming increasingly into favour, especially in the preliminary stage. The illustrated appliances and supports for the hard and soft tissues are models of prosthetic ingenuity, skill and delicacy. Complications are outlined and effective treatment, including chemotherapy, described, while a chapter is given to the bone grafting technique developed at the Third London General Hospital, the book closing with a valuable statistical analysis of the material on which it was prepared. A particular feature which will be much appreciated is the large number (194) of illustrations, including several of cases twenty years after treatment. These are of the utmost instructional value and greatly enhance the practical guidance which was the object of this book's preparation and which will contribute markedly to its undoubted success. The general setting-up of the book is also a matter for compliment—large, clear type on excellent paper, subdivision into paragraphs with prominent headings, and large illustrations. Lastly, in these days of mounting costs of production, the price of fifteen shillings is reasonable. The success of this publication is assured and the demand for it should necessitate further editions.

S. H. W.

**WAR WOUNDS AND INJURIES.** Edited by E. Fletcher, M.A., M.B., M.R.C.P., and R. W. Raven, F.R.C.S. London: Edward Arnold & Co. 1940. Pp. viii + 262. Price 14s. net.

This small textbook, which is based on articles appearing in the *Post Graduate Medical Journal*, by many well-known authorities, forms a welcome and useful addition to the armamentarium of the general surgeon both military and civil.

In its two hundred and sixty pages it deals with war wounds and injuries which are commonly encountered in the various parts of the body. There is an excellent section on wounds of the chest, which will be invaluable to the general surgeon who is called upon occasionally to deal with such conditions and is uncertain, so much has this become a speciality in peace time conditions, how to proceed.

Beautifully illustrated, the subject matter is presented in a sound and concise form. If one might offer one small criticism, it is that the work would be improved by the addition of a chapter or two on wounds of the soft tissues in general and fractures in view of the large percentage of injuries which fall into this class. Perhaps we may hope to see this addition in a further edition of an excellent work.

R. B.

and followed by gentle friction. Immersion in a cold and gradually warmed bath is also suitable. After thawing, the skin is dried and powdered.

If digits become blue and swollen by the extravasation of blood, deep incisions are recommended. Partial elevation promotes the venous return. Bier's passive congestion to promote hyperæmia is not suitable, as it succeeds only with a normal vascular system. In the absence of gangrene, the frost-bite may be treated by alternate hot and cold baths repeated night and morning. The water should be as cold and as hot as can be tolerated and the limb immersed in the cold for only 5 seconds and in the warm for 2 minutes. Oak bark may be added to the water. If necrosis has occurred the part must be kept dry to avoid moist gangrene. With gangrene there is also a persistent, cyanotic cedema of the neighbouring parts which interferes with healing. So far as possible the vasoconstriction must be relieved by vasodilator remedies. Padutin may be used but its effect is uncertain and may be delayed.\* More rapid vasodilatation may be ensured by nerve or spinal anæsthesia or by sympathectomy. Spinal anæsthesia is advised for the lower limbs.

R. T. GRANT.

*Reprinted from "Bulletin of War Medicine," November, 1940.*

---

## REVIEWS.

---

THE NEUROSES IN WAR. By Several Authors. Edited by Dr. Emanuel Miller (now Major, R.A.M.C.). London: Macmillan & Co. 1940. Pp. xii + 250. Price 10s. 6d.

Psychological disorders tend to be something of a puzzle to the average medical man, since medical training in past years was unable to keep pace with the development of knowledge in this field. This volume, by a group of authors, most of whom have practical experience of psychological problems dating back to the war of 1914, attempts to summarize accepted diagnosis and therapeutic knowledge in relation to neuroses. It should be of the greatest value.

The opening chapter, with a subsequent bibliography, gives a survey of the best-known British, American, French and German publications on the neuroses of war. Three following chapters are on the mode of onset of neuroses and on the varied way in which these disorders may first present themselves to the regimental medical officer. The next three chapters deal with the clinical types, differential diagnosis and psychopathological background of this group of disorders, and attention is paid to such topics as the physiological disturbances of emotional origin popularly known nowadays as psycho-somatic disorders, and the differential diagnosis between various "organic" disorders that present psychological symptoms and true neurosis.

---

\* [According to Martindale's *Extra Pharmacopœia*, padutin is a preparation of a vasomotor hormone from the pancreas. It may be given either orally or by intramuscular injection for Raynaud's disease and conditions associated with angiospasm.—Ed.]

Treatment is dealt with in the next three chapters, of which the first contains a dramatic description of the work of an advance psychiatric centre which attempted to treat neuroses behind the front line in the last war. It is followed by detailed description of the use of suggestion and hypnotic analysis—a method which proved particularly valuable in dealing with the more acute emotional disturbances found on active service. The third treatment chapter deals with the general approach to a patient with neurosis, and describes the general principles of psychotherapy. The manual proper concludes with a historical survey of psychiatric services as developed in different European armies, with some observation on the applicability of these principles to current problems. There is an interesting discussion on the nature of, and differences between, civilian and military morale, and lastly, a summarizing chapter which attempts to draw general conclusions. The important appendices contain the gist of the report of the War Office Committee of Enquiry on Shellshock (1922), a description of the E.M.S. treatment facilities for civilian psychoneurotic casualties, a classification of psychological disorders commonly found in war and an epitome of psychiatric pharmacology, including the use of evipan. There is a bibliography of over two hundred items and an index.

The volume seems to have avoided, to a rather unexpected extent, the difficulties implicit in multiple authorship, though the editing and proof reading will be improved in a second edition. It is written with a minimum of technical language, and, although there can be little question that some parts of it might be extensively elaborated in the light of more recent knowledge, it seems to fulfil its purpose of introducing the average medical officer to a field of medicine where guidance is not easily obtained. Few will think their half guinea ill spent on this book which might well be a work of reference for all medical units.

THE ANATOMY OF THE EYE AND ORBIT. 2nd edition. By Eugene Wolff, M.B., B.S.Lond., F.R.C.S.Eng. London: H. K. Lewis & Co., Ltd. 1940. Pp. x + 374. Price 31s. 6d.

This work on the anatomy of the eye and orbit has now become well known as providing in a simple and concise form the essentials on the structure, development and phylogeny of the eye, its adnexa and its central nervous connections. In the second edition, which has now appeared, little change has been made in the text apart from the section on the blood-supply of the visual pathway, which has been re-written to embody the author's valuable original observations: as in the previous edition, not the least of its merits are the many references to points of medical and surgical importance which depend on anatomical features. The greatest value of the work, however, lies in its illustrations which are liberal in number, excellent in quality and extremely informative in design. In this second edition some sixty have been added, the great majority of which have either been drawn by the author or prepared from his microscopic

sections. Some of these are excellent, of particular interest being the preparations of the retina. The appeal of a monograph of this type is, of course, restricted; but for the student and specialist it is unique in English literature.

S. D. E.

**THE PSYCHOLOGY OF FEAR AND COURAGE.** By Edward Glover. Penguin Books, Ltd. 1940. Pp.128.

This booklet, produced mainly from material for broadcasting by the B.B.C., is written in language understandable by the layman not versed in the science of the psychology of fear and courage.

The common-sense lines taken up by the author should do much to allay the fears of any interested reader in these times of stress.

**INJURIES OF THE JAWS AND FACE**, with special Reference to War Casualties. By W. Warwick James, *O.B.E.*, *F.R.C.S.*, *L.D.S.Eng.*, and B. W. Fickling, *F.R.C.S.*, *L.D.S.Eng.* London: John Bale & Staples Limited. 1940. Pp. xi + 200. 194 Illustrations. Price 15s., postage 6d. extra.

Ever since the war clouds burst over Europe, dental officers of the fighting and emergency medical services have wished for an up-to-date reference book on war injuries of the jaws, written from the essentially dental aspect by an author of extensive experience. The available literature on the subject, dating mainly to the last war, is limited, scattered and not readily accessible, while the valuable Report of the Army Advisory Standing Committee on Maxillo-Facial Injuries (1934) is confined by terms of reference to a brief outline of general principles. This book is, therefore, most opportune, and the authors are to be thanked for this concise, practical guide, which should be studied by every dental officer, and, with advantage, by all medical officers. It was a major dental tragedy of the Great War that the authorities, with the lapse of time, ultimately destroyed the case histories, radiographs and photographs of the thousands of jaw cases treated at the various home hospitals when these closed down, and it was a happy thought of Mr. James to preserve for future study some odds and ends of material of his cases at the Third London General Hospital, for the book is mainly based on his collection. Only those who have attempted to piece together disconnected notes, radiographs, models and appliances, frequently without identification and date, can truly appreciate the labour and patience required, and the several months taken for the analysis of the material and preparation of the book are readily understood. Starting with organization, the specialized nature of the injuries and the necessity for trained particular teams to deal with them at the outset are stressed. The significant anatomical features which influence the character of the injury, its diagnosis and treatment, physiology of bone repair, radiographic technique and interpretation, are next considered, followed by the impact effects of missiles on the soft and hard tissues, with the types of wounds produced, a thorough

understanding of which is essential for successful treatment. The bulk of the book is then given to emergency, preliminary and special treatments, so extensively illustrated and lucidly described that the whole sequence from time of wound is easily followed, and these will be the chapters most closely studied. So wide a field permits of much variation in operative and prosthetic procedure and techniques favoured by the authors are given due prominence, though the alternatives are also considered. Eyelet interdental wiring is recommended whenever possible, and there is no doubt it is coming increasingly into favour, especially in the preliminary stage. The illustrated appliances and supports for the hard and soft tissues are models of prosthetic ingenuity, skill and delicacy. Complications are outlined and effective treatment, including chemotherapy, described, while a chapter is given to the bone grafting technique developed at the Third London General Hospital, the book closing with a valuable statistical analysis of the material on which it was prepared. A particular feature which will be much appreciated is the large number (194) of illustrations, including several of cases twenty years after treatment. These are of the utmost instructional value and greatly enhance the practical guidance which was the object of this book's preparation and which will contribute markedly to its undoubted success. The general setting-up of the book is also a matter for compliment—large, clear type on excellent paper, subdivision into paragraphs with prominent headings, and large illustrations. Lastly, in these days of mounting costs of production, the price of fifteen shillings is reasonable. The success of this publication is assured and the demand for it should necessitate further editions.

S. H. W.

WAR WOUNDS AND INJURIES. Edited by E. Fletcher, M.A., M.B., M.R.C.P., and R. W. Raven, F.R.C.S. London: Edward Arnold & Co. 1940. Pp. viii + 262. Price 14s. net.

This small textbook, which is based on articles appearing in the *Post Graduate Medical Journal*, by many well-known authorities, forms a welcome and useful addition to the armamentarium of the general surgeon both military and civil.

In its two hundred and sixty pages it deals with war wounds and injuries which are commonly encountered in the various parts of the body. There is an excellent section on wounds of the chest, which will be invaluable to the general surgeon who is called upon occasionally to deal with such conditions and is uncertain, so much has this become a speciality in peace time conditions, how to proceed.

Beautifully illustrated, the subject matter is presented in a sound and concise form. If one might offer one small criticism, it is that the work would be improved by the addition of a chapter or two on wounds of the soft tissues in general and fractures in view of the large percentage of injuries which fall into this class. Perhaps we may hope to see this addition in a further edition of an excellent work.

R. B.



# JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

## Corps News.

MARCH, 1941.

### EXTRACTS FROM THE "LONDON GAZETTE."

The KING has been graciously pleased to approve that the following be mentioned for distinguished services in the field in Somaliland :—

*East African Army Medical Corps.*

Capt. B. A. Coghlan.

The KING has been graciously pleased to approve of the publication of the name of the undermentioned as having been commended for brave conduct :—

*Royal Army Medical Corps.*

No. 7346853 Pte. J. Nicholson.

*Jan. 7.*—The undermentioned Maj.s. to be Lt.-Col.s. :—

(Temp. Lt.-Col.) R. D. Davy, *M.C.*, *M.B.* (15647). Nov. 27, 1940.

F. McKibbin, *M.B.* (8445). Dec. 8, 1940.

K. M. Nelson, *M.C.* (24819). Dec. 16, 1940.

*Short Service Commission.*—Capt. T. D. M. Martin, *M.B.* (66502), relinquishes his comm. on account of ill-health. Jan. 7, 1941.

*Jan. 17.*—Col. J. T. Johnson, *D.S.O.*, *M.D.* (33124), ret. (late *R.A.M.C.*), at his own request, reverts to the rank of Lt.-Col. whilst empld. during the present emergency. Dec. 16, 1940.

*Jan. 31.*—The undermentioned Capt.s. (temp. Maj.s.) to be Maj.s. :—

P. J. Richards (51985). Jan. 26, 1941.

C. A. de Candole (49751). Jan. 27, 1941.

*Short Service Commissions.*—The appt. of Lt. D. B. Jagger, *M.B.* (99110), is antedated to Jan. 12, 1939, under the provs. of Art. 39 Royal Warrant for Pay & Promotion, 1940, but not to carry pay and allces. prior to Sept. 3, 1939.

Lt. D. B. Jagger, *M.B.* (99110), to be Capt. Sept. 3, 1940, with seniority Jan. 12, 1940. (Substituted for the notifi. in the *Gazette* of Oct. 22, 1940.)

The appt. of Lt. J. A. Allen, *M.B.* (100136), is antedated to Sept. 4, 1938, under the provs. of Art. 39 Royal Warrant for Pay & Promotion, 1940, but not to carry pay and allces. prior to Sept. 4, 1939.

Lt. J. A. Allen, *M.B.* (100136), to be Capt. Sept. 4, 1940, with seniority Sept. 4, 1939. (Substituted for the notifi. in the *Gazette* of Oct. 25, 1940.)

### Regular Army Reserve of Officers.

*Feb. 7.*—Maj. D. W. John, *M.C.* (51042), ceases to belong to the Res. of Off. on account of ill-health. Jan. 28, 1941.

Capt. B. Malaher (5319), to be Bt.-Maj. Dec. 15, 1940, under the provs. of Art. 168, Royal Warrant for Pay and Promotion, 1940.

### QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

*Jan. 14.*—Sister Miss M. Gordon resigns her appt. Oct. 15, 1940. (Substituted for the notifi. in the *Gazette* of Nov. 15, 1940.)

*Jan. 17.*—Sister Miss R. A. Coombe resigns her appt. Jan. 7, 1941.

*Jan. 24.*—Matron Miss C. L. A. Robinson, *M.M.*, *A.R.R.C.*, having attained the age for retirement is placed on ret. pay. Jan. 15, 1941.

The undermentioned Sisters resign their appointments :—

Miss M. E. May. Nov. 30, 1940.

Miss J. K. Smith. Jan. 18, 1941.

The undermentioned Staff Nurses to be Sisters :—

Miss M. E. McEwan. Nov. 14, 1940. (with seniority next below Miss E. M. Stonham).

Miss M. G. Harrison. Nov. 15, 1940. (with seniority next below Miss I. E. Paddon).

Miss V. Kelly. Nov. 20, 1940.

Miss M. E. Leitch. Nov. 25, 1940.

Miss E. M. Spreckley. Dec. 1, 1940.

Miss M. R. Treveleyan. Dec. 1, 1940.

Miss M. Caudwell. Dec. 1, 1940.

*Jan. 31.*—Sister Miss G. Roberts, having

attained the age for retirement, is placed on ret. pay. Jan. 7, 1941.

*Feb. 7.*—Sister Miss D. E. Bensley retires on ret. pay on account of ill-health. Feb. 8, 1941.

The undermentioned Sisters resign their appts. :—

Miss F. H. Stewart. Nov. 16, 1940.

Miss W. Kelleher. Jan. 27, 1941.

Miss D. M. Blood. Jan. 30, 1941.

Miss J. N. S. Campbell. Feb. 5, 1941.

The notifn. regarding Sister A. B. P. Smele in the *Gazette* of Jan. 3, 1941 is cancelled.

Staff Nurse Miss F. M. Osborne resigns her appt. Dec. 29, 1940.

The undermentioned Staff Nurses to be Sisters :—

Miss F. I. S. Hedge, Dec. 1, 1940 (with seniority next below Miss M. Hellen).

Miss J. Marchant. Dec. 1, 1940.

Provl. Staff Nurse Miss E. F. Shine is confirmed in her appt.

---

## ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

THERE is not much fresh news to report this month. More parcels have been sent to the Middle East and to units in the United Kingdom.

The Committee would be glad if any unit who is short of any special game, for example, a Dart Board, Deck Tennis, Chess, etc., would write to the Honorary Secretary. This also applies if there is a real shortage of knitted comforts. We ask for this information, as it is impossible to supply everyone at present, and it would make our task much easier if units would co-operate in this way.

We are glad to say that more knitting parties have been formed during the month. We hope to collect, during the Spring and Summer, a large supply of woollies for distribution in the Autumn. We cannot have too many knitters.

May we ask again for books and playing cards. The response to our last appeal was practically *nil*.

The Committee would like to thank once again all those who are working so splendidly for the Guild. If they could see the appreciative letters we receive, they would feel rewarded.

---

## DEATHS.

**FALKNER.**—On October 9, 1940, in Malta, Lieutenant-Colonel Percy Hope Falkner, R.A.M.C., F.R.C.S.I. Born in Bray, Co. Wicklow, February 16, 1876, he was commissioned Lieutenant July 27, 1899, and retired March 23, 1926. In the South African War he took part in the Relief of Ladysmith, being present at the actions at Colenso, Spion Kop, Vaal Kranz, operations on Tugela Heights (February 14 to 27, 1900) and the actions at Pieters Hill; also in the operations in Natal March to June, 1900, and the action at Laings Nek (June 6 to 9, 1900). He served in France and Belgium in 1914-1915 being awarded the 1914 Star and Clasp, the British War and Victory Medals. He was brought to notice for valuable services rendered in connexion with the war.

**FOWLER.**—On January 21, 1941, Colonel Charles Edward Percy Fowler, *O.B.E.* Colonel Fowler was born in Milverton, Somerset, January 27, 1866. Becoming M.R.C.S. and L.R.C.P. in 1889, he took the F.R.C.S. in 1891, and the D.P.H. Cambridge in 1894. Commissioned as Surgeon Lieutenant July 29, 1893, he became Surgeon Captain July 29, 1896,

Major R.A.M.C. January 30, 1905, and retired February 4, 1914. He was Assistant Professor of Hygiene, R.A.M. College, 1903 to 1907, and M.O.H. and Sanitary Officer, Gibraltar, 1907 to 1912. He accompanied the British Mission to Fez, Morocco, in 1909. Appointed Instructor, Army School of Sanitation, February 17, 1913, he retired February 4, 1914. Recalled to the Active List on the outbreak of war in August, 1914, he was D.A.D.M.S. Aldershot Command 1914 to 1916 and later A.D.M.S. San. with the Egyptian Expeditionary Force. Mentioned in despatches *London Gazette* June 5, 1919, he received the Brevet of Lieutenant-Colonel, the *O.B.E.*, British War and Victory Medals and became Colonel May 8, 1919. He contributed articles to the *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS*.

**CLEMENTS.**—On January 22, 1941, in Ootacamund, Southern India, Colonel Robert William Clements, *C.M.G.*, *D.S.O.* Colonel Clements was a graduate of the old Royal University of Ireland, where he took the M.B. in 1894. He took the D.P.H., Cambridge, in 1906, and the D.T.M. and H., Liverpool, the same year. Born in

Pomeroy, Co. Tyrone, April 7, 1870, he was commissioned Surgeon Lieutenant July 29, 1896, Captain R.A.M.C., July 29, 1899, Major January 29, 1908, Lieutenant-Colonel March 1, 1915, and Colonel December 26, 1917. On his retirement on February 24, 1922, he settled in Ootacamund, where for some years he was Superintendent of the Convalescent Home for Officers. He served in France from September, 1914, till the end of the war, being awarded the *C.M.G.*, *D.S.O.*, 1914 Star, British War and Victory Medals. He was five times mentioned in despatches.

**STANISTREET.**—On January 26, at Bourne-mouth. Major-General Sir George Bradshaw Stanistreet, *K.B.E.*, *C.B.*, *C.M.G.*, Born on May 13, 1866, the son of Richard Stanistreet, M.D., he was educated at Windermere College and at Trinity College, Dublin, where he graduated in arts and medicine. Being successful in the competitive examination for a commission in the A.M.S., he entered Netley in 1891 and was gazetted Lieutenant. Sent to India for his first tour abroad, Stanistreet became the personal assistant to the P.M.O., Punjab Command, in 1896; and while holding that office left Peshawar for the North-West Frontier campaign of 1897-98. On reverting to home service in 1902 he was stationed at Southampton on appointment as embarkation officer, with duties that entailed medical supervision of all troops and trooper-transport leaving and entering its docks.

In 1906 Stanistreet was installed as Staff Officer to the P.M.O., Southern Command, with headquarters at Salisbury, and later he held a series of staff appointments at the War Office, beginning in 1913 and continuing uninterruptedly till 1922. These included the posts of D.A.D.G., 1913-17, A.D.G. 1917-18, and D.D.G. 1918-22. The first-named appointment dealt with the collection, distribution, and despatch of all medical and surgical supplies and equipment to British forces engaged on all battle fronts, and to hospitals receiving sick and wounded from the same, Mesopotamia excepted. In 1917 Stanistreet took over the appointment of A.D.G., one which chiefly concerned R.A.M.C. personnel, and in 1918 he became D.D.G. and was promoted Major-General. On retirement in 1922 he was made *K.B.E.*, having previously been made *C.M.G.* and a *C.B.* He was made an officer of St. John of Jerusalem.

**DANSEY - BROWNING.**—On February 2, at Sidmouth, Colonel George Dansey-Browning, *C.B.E.*

A correspondent writes :—

His service was devoted to the welfare of the soldier and his dependants. The special qualifications he obtained after

joining the Army were sought and gained with that object in view.

"Dansey" was born in November, 1870, and was educated at the Royal Naval School and at the Lorient Lycée, Rennes. He was an accomplished French scholar. A student of the Westminster Hospital he took the diplomas of M.R.C.S., L.R.C.P., and then passed by competition into the Army Medical School, Netley. At his homecomings from foreign service he took opportunities to gain the diplomas of D.P.H. Edinburgh and the D.M.T. of Liverpool, and, lastly, the M.R.C.P. of London. He embarked for China for special service in 1900, being awarded the medal and, after a home tour, was appointed M.O.H. of Gibraltar, where he served during the last war. His labours were chiefly concerned with the prevention and mitigation of diseases incidental to the climate and to the varied and shifting population of a great maritime port.

For his services Dansey-Browning was made *C.B.E.* in 1919 and awarded the French Medal for Epidemics and the British War Medal. In 1922 he was appointed to an administrative post in the United Provinces of India with headquarters at Lucknow; and on retirement in 1928 was selected as the organizing director of the newly formed Enham Village centre for disabled service men. That accomplished, he elected to take over a retired pay billet as medical officer to the troops at Longmoor. There he devoted his days and nights to the soldier and his family. All matters concerning the welfare of mother and child were fostered and dealt with with outstanding merit. His ways were ways of gentleness, with a simple and quiet devotion to the sick and needy, and he will long be remembered as a well-tryed and beloved physician.

In 1907 Dansey-Browning married Lilian, daughter of General Stoddart, of the Indian Army. They had a son and a daughter. The son, Major Charles Dansey-Browning, is serving with the R.A.M.C.

**JOHNSON.**—In Swaffham, Norfolk, on February 4, 1941, Major (Temporary Lieutenant-Colonel) Reginald Johnson, *M.B.E.*, R.A.M.C., M.D. Dublin. Born September 13, 1888, Colonel Johnson was educated at Trinity College, Dublin, where he took the M.B. in 1912, and proceeded to the M.D. in 1914. Commissioned as Temporary Lieutenant January 10, 1916, he became Temporary Captain January 10, 1917. He received a permanent Commission September 1, 1920, and was promoted Major January 10, 1928. He served in France in 1916 and 1917, being awarded the *M.B.E.*, British War and Victory Medals, and the Campaign in Waziristan 1921-1924, being awarded the Medal with Clasp.

845.5. 76:4























































































































































































































May, 1941.

Vol. LXXVI.

# Journal

OF

THE

5

# Royal Army Medical Corps

ISSUED

MONTHLY



EDITOR

COLONEL S. LYLE CUMMINS, C.B., C.M.G.

ASSISTANT EDITOR

LIEUTENANT-COLONEL H. A. SANDIFORD, M.C., R.A.M.C.

MANAGER

LIEUTENANT-COLONEL W. J. F. CRAIG, R.A.M.C.

## CONTENTS

### ORIGINAL COMMUNICATIONS.

PAGE

ADDRESS.

PAGE

- An Analysis of 204 Cases of Cerebro-spinal Fever amongst the British Troops of the British Expeditionary Force in France. By Major-General ROBERT PRIEST, M.A., M.D., F.R.C.P., K.H.P. . . . . 249
- Reorganization of a Field Ambulance. By Lieutenant-Colonel H. L. GLYN HUGHES, D.S.O., M.C., R.A.M.C. 261
- Phthisis following Pleurisy. By Captain W. LAURIE, I.M.S. . . . . 270
- The Treatment of the Soldier's Foot. By Major ARTHUR J. HELFET, B.Sc., M.D., M.Ch.(ORTH.), F.R.C.S., R.A.M.C. . . . . 282

### EDITORIAL.

- A New Kind of Shock . . . . . 286

- Army Welfare and Education . . . . . 289
- CLINICAL AND OTHER NOTES.
- Atypical Smallpox. By Major P. F. PALMER, R.A.M.C. . . . . 290
- Hand Carriage of Wounded. By Captain W. D. LIVINGSTONE SMITH, R.A.M.C. . . . . 294
- Report on a Case of Multiple Injuries. By Captain M. J. G. FURNELL, R.A.M.C. . . . . 295
- Some Notes on an Improved Type of Otway Pit. By Major W. J. ROBERTSON, R.A.M.C. . . . . 296
- CURRENT LITERATURE . . . . . 300
- REVIEWS . . . . . 301
- CORRESPONDENCE . . . . . 307
- NOTICES . . . . . 309

JOHN BALE & STAPLES LIMITED

83-91 GREAT TITCHFIELD STREET LONDON W.1

Price Two Shillings and Sixpence net

DOCUMENTS DEPARTMENT

OCT 20 1950

LIBRARY

Digitized by Google



## LOCAL ANÆSTHESIA IN SURGICAL PRACTICE

Novocain has been in general use in all the chief Hospitals for over 20 years. Conclusive proof of its efficacy is now to be found in every standard work on Local Anæsthesia.

For every type of MAJOR AND MINOR SURGICAL OPERATION.

Hypodermic Tablets "A" for Minor Surgical Operations.

" " "B" for Block Anæsthesia.

" " "C" for Spinal Anæsthesia.

" " "E" for Dental Extractions.

Solutions in Cartridges, Ampoules and Stoppered or Rubber Capped Bottles.

*Does not come under the restrictions of the Dangerous Drugs Act.*

We invite applications for reports and details of major and minor operations with Novocain.

# NOVOCAIN

*Brand Ethocain  
Hydrochloride*

**The Original Preparation.**

English Trade Mark No. 276477 (1908).

As supplied to the R.A.M.C., War Office, Admiralty, Crown Agents for the Colonies, &c.

*Sold under Agreement*

**The SACCHARIN CORPORATION, Ltd., 84, Malford Grove, Snaresbrook, London, E. 18**

Telegrams: "SACARINO, RATH., LONDON."

Telephone: WANSTEAD 3287

Australian Agents—J. L. BROWN & Co., 123, William Street, Melbourne, C.I.

Please send a postcard or your professional card  
for a clinical sample, and explanatory literature of

## "CURICONES" Anti-Rheumatic Capsules

SUPPLIED TO OVER 6,050 DOCTORS

*(Figures certified by Chartered Accountants)*

**STEPHEN MATTHEWS & CO., LTD.,**

*Manufacturing Chemists and Druggists,*

19/21, FARRINGTON STREET, LONDON, E.C.4.

## CHRISTOPHER & CO. LTD.

**WINE MERCHANTS,**

**43, PALL MALL, LONDON, S.W. 1**

**MILITARY MESSES SPECIALLY CATERED FOR.**

**FOR OVER 30 YEARS SUPPLIERS TO R.A.M.C. HEADQUARTERS MESS**

Telephone: WHITEHALL 5557/8.

When writing advertisers please mention "Journal of the R.A.M.C."

---

Authors are alone responsible for the statements  
made and the opinions expressed in their papers.

---

Journal  
of the  
Royal Army Medical Corps.

---

Original Communications.

---

AN ANALYSIS OF 204 CASES OF CEREBROSPINAL FEVER AMONGST  
THE BRITISH TROOPS OF THE BRITISH EXPEDITIONARY  
FORCE IN FRANCE.

BY MAJOR-GENERAL ROBERT PRIEST, M.A., M.D., F.R.C.P., K.H.P.,  
*Consulting Physician, B.E.F.*

THE 204 cases which form the subject of this report occurred amongst the troops serving with the British Expeditionary Force in France and were collected during the period from February, 1940, at a time when the incidence of cerebrospinal fever was rising rapidly week by week, up to June 14, 1940, after which date further observations became impossible. All these patients were seen by me at some period or other of their illness, some in the forward area units, a few in ambulance trains and the majority at the general hospitals at the evacuation bases. Also, some patients who had been transferred to the Convalescent Depot were seen by me again at varying periods after their discharge from hospital. The information for this report has been derived from the Field Medical Cards (Army Form W. 3118), the Medical Case Sheets (Army Form I. 1237), the Record Cards (Army Form I. 1220), Temperature Charts, the Infectious Disease Reports (Army Form A. 35) and from the histories I obtained from the patients themselves. Here I should like to express my thanks to all the medical officers who looked after these patients for their whole-hearted co-operation in supplying, under active service conditions, all the detail which is so essential for making a report of this nature. Before the collection of this series was commenced, it had been realized that the sooner patients were got under the influence of sulphapyridine the better the chance of complete

recovery. Delay in getting such patients under this influence was seen to be largely due to the very protean nature of the onset of the illness and in order to emphasize this point it was arranged that Major F. J. O'Meara, R.A.M.C., should give an address to all medical officers serving with units in the forward areas, to remind them of the very varied and sometimes very deceptive manner of onset of cerebrospinal fever. I feel sure that this measure played a large part in producing, under Field conditions, so low a mortality rate, a figure which compares very favourably with that of the population at home, where ideal conditions for transport and treatment existed.

The total of 204 consists of 171 bacteriologically proved cases and a group of 33 cases in which the symptoms, physical signs, clinical course and the general characteristics of the cerebrospinal fluid itself were typical of cerebrospinal fever but in which, for some reason or another, the causal organism was not seen in the stained film or failed to grow on the culture medium. Included in the clinical group are two cases in which the organism was recovered from the nasopharynx.

Intermingled with all these cases were 23 instances of other conditions resembling cerebrospinal fever in the early stages, such as meningism, most probably influenzal, early encephalitis lethargica, encephalitis of unknown cause but sometimes associated with rubella, lymphocytic meningitis, post-traumatic and concussive states and pneumococcal meningitis. It is of interest to mention that the patient suffering from the latter infection responded very well to sulphapyridine therapy and was eventually transferred to the United Kingdom.

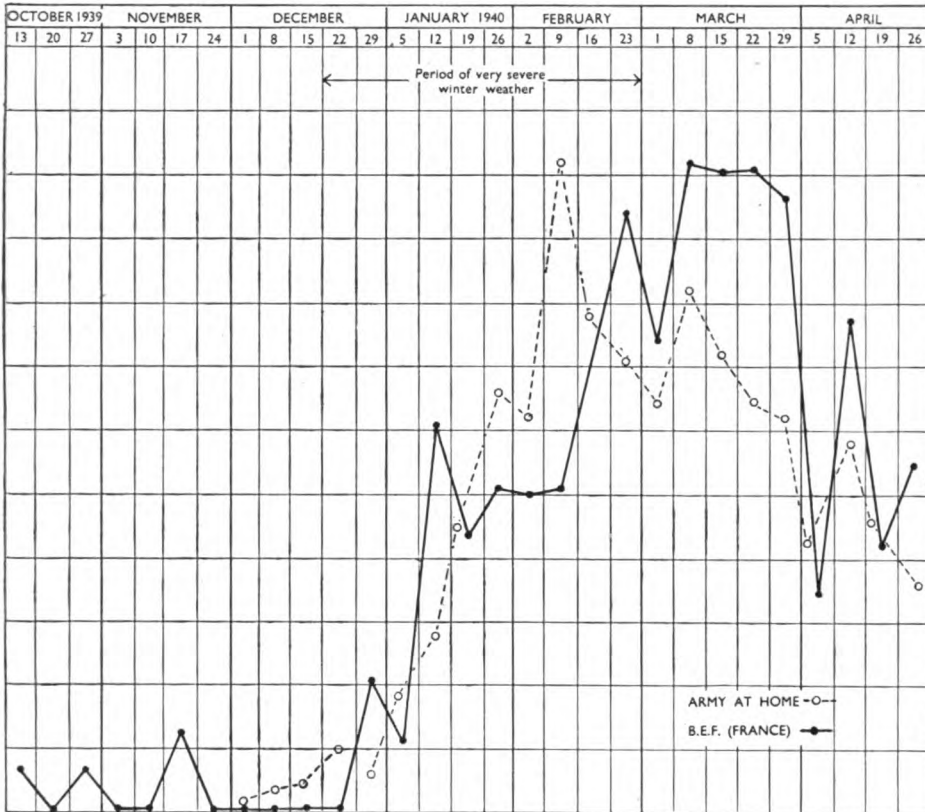
#### INCIDENCE.

At no time did the infection show any tendency to become epidemic and, as far as it could be ascertained, there was one instance only where a man sleeping in a bed next to an actual sufferer contracted the disease. On the contrary, its sporadicity was a particularly well-marked feature neither did any one unit appear to suffer more than another.

The chart, Table I, shows the curve of the weekly incidence of cerebrospinal fever in ratios per 1,000 from October 13, 1939, to April 26, 1940, in the Army at Home and in the Army in France. For security reasons the actual figures have to be omitted. The real cold weather set in in France suddenly during the week ending December 23, and lasted almost without a break until late in February; it proved itself to be a winter of exceptional severity with hard frost, snow and biting winds. It was to be expected that the advent of this real wintry weather would cause the troops to spend a greater proportion of their time indoors, leading to unavoidable overcrowding for unusually long periods during both daytime and the increasing hours of darkness. Add to this the impossibility of ensuring adequate ventilation in all buildings where troops gather during the hours of blackout,

and the well-recognized, ideal conditions are created for the spread of cerebro-spinal fever. This observation is made merely to confirm that in the mode of spread this disease behaved normally. It will be seen from the chart that the first high peak of incidence was reached during the week ending February 23, some fourteen days later than that of the Army at home. The highest incidence, however, was recorded in the week ending March 8, a figure which showed no great change up to March 29, after which it fell with

TABLE I



extraordinary rapidity following a period of very welcome betterment in the weather.

#### AGE-INCIDENCE.

No age appeared exempt but, as the troops in France were nearly all young men and formed what may be regarded as a more or less "selected" population, it is natural to expect that the greatest incidence would fall in the young age-group. The oldest patient was 45 and the youngest 18, and the average age 25·6. The ages of two men were not stated.



TABLE II.

Age	No.	Age	No.	Age	No.
18 ..	5	27 ..	6	36 ..	3
19 ..	11	28 ..	6	37 ..	6
20 ..	29	29 ..	19	38 ..	3
21 ..	27	30 ..	7	39 ..	1
22 ..	14	31 ..	4	40 ..	2
23 ..	17	32 ..	3	41 ..	1
24 ..	10	33 ..	2	42 ..	1
25 ..	7	34 ..	3	45 ..	1
26 ..	7	35 ..	7		

In the series there were three officers, two nursing sisters and the remainder other ranks.

## ONSET.

It has already been mentioned how varied and deceptive the symptoms and physical signs may be in the very early stages of cerebrospinal fever and this was confirmed by a review of the diagnoses made by medical officers who saw the patients at an early stage of their illness. There were 73 "early diagnoses" collected from the field medical cards and these included cerebral conditions: meningitis 8, cerebrospinal meningitis 6, severe headache 4, meningismus 2, cerebral irritation 2, mental confusion 2, meningeal signs 1, mental irritability 1, injury to head 1, N.Y.D. hysteria 1, neurasthenia 1, subarachnoid hæmorrhage 1. Total 30, i.e. 41.1 per cent referable to some intracranial or cerebral abnormality. Influenza 13, acute gastritis 4, gastric influenza 1, enteritis 1, acute appendicitis 1, malaria 1, enteric fever 2, pyrexia of uncertain origin 4, acute rheumatism 2, muscular rheumatism 2, general pains 2, renal colic 1, subacute nephritis 1, broncho-pneumonia 1, bronchitis 1, sore throat 1, pharyngitis 1, erythema nodosum 1, dermatitis 1, epistaxis 1, acidosis 1.

Broadly speaking, cerebrospinal fever appeared in the B.E.F. in France in the following forms:

Severe fulminating type with rapid loss of consciousness and in which the meningeal signs occurred rather late. These patients appeared cyanosed, toxæmic and, if vomiting had been excessive, dehydrated; if the real nature of condition was not appreciated and the administration of sulphapyridine was delayed, a fatal termination was more than probable.

A form having an acute onset with signs of meningitis from the outset; fortunately this is the more usual form.

Those suffering from a chronic meningococcal bacteraemia for varying periods of time, days, weeks or months, with or without the presence of the causative organism in the post-nasal swab. This bacteraemia may cause a diversity of symptoms according to the region affected and may at any time terminate in the cerebrospinal form with either an acute or a slow insidious onset. In the latter event, the transition of the cerebrospinal fluid from a clear fluid containing a few lymphocytes to a turbid or purulent one with positive bacteriological findings has been observed.

Careful histories were taken from 107 patients and it was found that in 56 cases the onset was sudden, i.e. the time of onset could be very definitely fixed by the patients; in 42 instances the men said they had gone to bed feeling quite well but that they had awakened either during the night or at *reveille* complaining of one or more of the early symptoms of the disease. A good proportion of these very quickly passed into a state of unconsciousness, stupor or coma. The histories led one to conclude that 19 were examples of the chronic septicæmic type terminating in the cerebrospinal form of meningococcal infection. Twelve patients stated that their illness came on soon after some form of exercise or exertion, e.g. football 5, bathing 2, night exercises 2, route march 1, digging 1, strenuous work in the sun 1. Trauma to the head was an immediate antecedent in 4 cases.

TABLE III.

Symptom described as	A Was the first symptom in 12 cases	B Was an early symptom in	C A symptom of established disease in
Like the start of influenza .. ..	12 cases	—	—
Off colour, queer, groggy, like T.A.B. inoculation (malaise) .. ..	14 "	—	—
Sore throat .. ..	8 "	—	—
Pain in chest .. ..	2 "	—	—
Fainting .. ..	1 "	—	—
Acute tenderness of scalp .. ..	1 "	—	—
Vomiting and diarrhoea .. ..	1 "	—	—
Shivering, cold sweats, shivers and sweats, like malaria (rigors) ..	42 "	47 cases	—
Cold in the head .. ..	8 "	1 "	—
Aches all over .. ..	9 "	23 "	—
General weakness .. ..	9 "	17 "	—
Stiffness of limbs .. ..	7 "	22 "	—
Joint pains .. ..	4 "	8 "	—
Bruised and tender muscles .. ..	3 "	1 "	—
Pains in back .. ..	3 "	4 "	—
Unsteady gait .. ..	2 "	5 "	—
Discharge from the eyes .. ..	1 "	1 "	—
Acute abdominal pain .. ..	1 "	4 "	—
Headache .. ..	53 "	142 "	149 cases
Vomiting .. ..	11 "	129 "	96 "
Pain or stiffness in neck .. ..	2 "	21 "	144 "
Excessive sweating .. ..	1 "	23 "	4 "
Dislike of light (photophobia) ..	—	5 "	22 "
Deafness .. ..	—	2 "	3 "
Blurred or double vision .. ..	—	7 "	4 "
Nose bleeding .. ..	—	3 "	1 "
Loss of smell .. ..	—	1 "	1 "

Table III gives a good impression of the symptomatic course as it occurred in the British Expeditionary Force. The information contained in column A represents the first symptom complained of by the patients themselves. Some of these symptoms may pass off quite soon, while others tend to persist and become the early symptoms described by medical officers in their notes as "condition on admission" in column B. The data for column C were extracted from all clinical material available and they showed that rigors, headache, vomiting and nuchal stiffness are the symptoms

which are most frequently seen in all stages of the disease. It should also be noted that certain symptoms tend to appear a little while after the onset and these in turn may either be transient, persistent or permanent defects, such as deafness, blurred vision or loss of smell.

Most commonly the headache was said to be behind the eyes, across the forehead, then spreading all over to reach the back of the head and down the neck. In other words, in the early stages the headache was nearly always frontal but in the well-established disease occipital. The headache has been described as terrible, pounding, throbbing, bursting, splitting, blinding, the worst headache ever, nothing relieved it, much worse on coughing or on movement. In one case headache was conspicuous by its absence throughout the illness.

Vomiting was sometimes troublesome and persistent. In some instances it was noted as projectile or cerebral in type, in others it simulated an acute gastritis when probably some article of food was held responsible for its cause. Vomiting was absent throughout in seventeen cases, while a few said they did not vomit until they started to take the sulphapyridine tablets. In a few cases sweating was a particularly striking feature and I remember one patient whom I saw in a Casualty Clearing Station whose face, head and forearms appeared to "steam." Closer inspection showed the skin to be covered with large beads of perspiration gradually coalescing and running down like raindrops on a window pane.

Pain and stiffness in the neck usually commenced a little while after the onset and, like the headache, showed a steady progressive increase in intensity to result in spasm sufficient to give well-marked retraction of the head.

Photophobia, too, while not a striking feature in the early stages was a fairly common symptom later on.

#### PHYSICAL SIGNS AND COMPLICATIONS.

On the whole, the abnormal physical signs tended to be of transient duration and had returned to normal by the time patients left the base hospitals. Unfortunately, owing to periodic emergency evacuations to the United Kingdom, it is impossible in this report to state the actual number of transient and permanent defects. Comparing the clinical course of the disease under treatment by sulphapyridine with that of the former method of repeated lumbar punctures combined with intrathecal injections of anti-meningococcal serum, it has been shown by several observers that there is a much smaller percentage of permanent loss of function after chemotherapy alone.

The mental disturbances reported were : drowsy 36, restless 26, delirious 21, unconscious 18, irritable 16, comatose 6, confused 6, dull 5, disorientated 5, stuporose 4, unable to sleep 4, noisy and violent 3, hallucinated 2.

Abnormal neurological signs discovered were : loss of sense of smell 1, permanent complete third nerve palsy 1, ptosis 2, nystagmus 4, strabismus 3,

weakness of external rectus of the eye 14, loss of corneal reflex 1, facial paresis 11, deafness 11, general rigidity 6, hemiplegia 1, localized anæsthesia 2, hyper-æsthesia 2, spasticity of arm 1, neuralgic pains in arms 4, in chest 1, in loins 1, paresis of arms 2, of legs 1, wrist drop 1, foot drop 1, lower motor neurone involvement 3. Abnormalities in general appearance : head retraction 32, cyanosis 11, collapsed and dehydrated 2, marked rigidity 6, jaundiced 1, silvery tongue 2. Tendency to hæmorrhages : epistaxis 3, one of which was very troublesome, streaking of subconjunctival vessels running from corneal margin to inner or outer canthus of eye 10, frank subconjunctival hæmorrhage resembling that seen in whooping-cough 6, subcutaneous hæmorrhage 2, submucous hæmorrhage 1, total 22. Evidences of inflammation : sore throat 8, tonsillitis 1, conjunctivitis 1, arthritis involving the shoulder-joint 2, elbow 5, ankle 2, wrist 1 ; effusion into the joint was noticed in 2 of these. Pyelitis 1, cystitis secondary to catheterization 1, glycosuria occurring with unconsciousness in one patient suggested diabetic coma. Hiccough was particularly troublesome and persistent in 2 cases. Reflexes : These exhibited great complexity of abnormal combinations but the most noticeable feature was their changeability from day to day, some showing only a passing, others a more permanent disturbance. Pupils were noted to be normal in 145, dilated in 9, small in 4, sluggish to light in 12, inactive in 5 cases. Knee-jerks : Normal in 87, brisk in 53, sluggish in 20, absent in 11, unequal in 10 ; ankle-jerks : normal in 96, brisk in 49, sluggish in 17, absent in 9, unequal in 11 ; abdominal reflexes : normal in 79, brisk in 40, sluggish in 7, absent in 42, unequal in 19. Babinski's sign was present bilaterally in 13, unilaterally in 14 ; Kernig's sign reported present in 133 and Brudzinski's sign in 10 cases. Retention-incontinence of urine was present in 19.

Herpes labialis and zoster. These were evident in 75 patients ; their presence was not, as a rule, an early sign, but showed a tendency to appear at any time after thirty-six hours from the onset. They were seen on the nose and lips in 51 instances, over the area supplied by one or more of the three branches of the 5th cranial in 16, over the area of supply of the cervical plexus 6, musculo-spiral 1, and intercostal nerve 1. In one instance they appeared over the nape of the neck and were frankly pustular, in three instances they involved the face extensively.

An eruption on the skin was reported in 78 cases and was described as petechial in 35, macular in 19, hæmorrhagic in 5, erythematous in 5, purpuric in 4, and mixed in 10 (petechial and macular 5, hæmorrhagic and macular 2, petechial and hæmorrhagic 1, petechial and purpuric 1, petechial, macular and hæmorrhagic 1). The most frequent situation of the rash was upon the trunk and limbs as is seen from the records : very extensive 5, trunk 10, legs 8, arms 7, trunk and limbs 5, abdomen 4, abdomen and chest 2. It can well be realized that a patient in the early stages of cerebrospinal fever with headache, fever and a few macules on the abdomen or lower chest would suggest an initial diagnosis of enteric fever. The erythematous

patches varied in size, some large and indurated and resembled erythema nodosum very closely; others, described as macules, were in reality small, reddish, firm, slightly raised and occasionally tender spots, which when associated as these were, with fever of varying duration and with joint pains, formed a typical picture of chronic meningococcal septicæmia before it assumed the cerebrospinal form.

*Cerebrospinal Fluid.*—In all, 200 patients were lumbar punctured and, of these, one failed owing to extreme rigidity of the spine and one proved to be a dry tap. The large majority of the pathological reports were made by Major C. H. Stuart Harris, R.A.M.C., and Major Francis, R.A.M.C., each of whom was in charge of a mobile laboratory in the forward area.

Pressure was much increased in 47, increased 60, not increased in 10, not stated in 81. Character described as thick 3, turbid 172, hazy or opalescent 16, clear 2, not stated 5. Stained film reported as positive 156, negative 30, not stated 12. Culture was positive in 98 cases, negative 68 times, no record 32. Stained film and culture were both positive 126 times, stained film positive, culture negative 47,<sup>1</sup> stained film negative, culture positive 6, both stained film and culture negative 19.

The presence of a well-marked clot was reported in 18 instances and, when clot was reported the cerebrospinal fluid was either thick or turbid. In 2 of the clinical series the meningococcus was recovered from the nasopharyngeal swab. In 52 cases the meningococcus was found, by cultural methods, to belong to Group I, in 3 to Group III. Five were Group I by the precipitin test, 1 was Group I by the agglutination test, and 3 were reported to belong to both Groups I and II.

The nature of the cells was reported in 111 fluids, pus cells being present in 109 and lymphocytes in 2. As a reason for the presence of lymphocytes alone, it is probable that at first only very few organisms left the bloodstream to cause slight meningeal signs and some evidence of meningeal reaction in the cerebrospinal fluid. In case No. 122, on March 1, the cells in the fluid were lymphocytes with no organisms in the film, on March 11 the cells numbered 3,810 with 63 per cent polymorphs and 36 per cent lymphocytes. On March 13, organisms were seen in plenty in the film. The history, too, suggested that this was an example of a chronic meningococcal bacteriæmia leading gradually to an involvement of the cerebrospinal meninges, to which reference has already been made. The highest polymorph count in the fluid was 43,400 and the highest lymphocytic count was 384 per c.mm. There were no relapsing cases in the series.

#### TREATMENT.

At the commencement some patients were treated with sulphapyridine and anti-meningococcal serum, but experience later showed that patients suffering from the severe and fulminating forms of the disease responded so

<sup>1</sup> It should be noted that of these there were ten instances where sulphapyridine had been administered *before* the time of lumbar puncture.

rapidly and well to chemotherapy without serum, the latter was considered superfluous and its use abandoned. In fact, in some instances, the advent of serum sickness proved to be a "nuisance value" and a check in an otherwise uneventful convalescence. During the early prevalence of the disease no standard of treatment was laid down and many medical officers followed the dosage recommended by Banks (1940) or were guided by the effects of the drug on the general condition of the patient. In consequence a wide variation of dosage is found in the case notes. Later still, the general lines of treatment became more universally standardized after the arrival of the memoranda on cerebrospinal fever and sulphonamides from the War Office (A.M.D.7) which were published from time to time.

In this series of 204 cases all received sulphapyridine but unfortunately in 13 instances there was no record of the dosage. The maximum dosage was 81 grammes over ten days, minimum dosage 14.5 grammes over six days. The average dosage per patient was 34.4 grammes over a period of 7.9 days. Fifty-five patients received intramuscular injection of the soluble sulphapyridine. One of these injections caused induration at the site of injection which eventually disappeared; another produced a slough on the skin which remained somewhat refractory and slow to separate. Seven patients received the drug intravenously. Cyanosis was the most frequently observed feature during sulphapyridine administration but proved no obstacle to the continuance of the treatment. A sudden fall in the polymorphonuclears occurred in two instances and in one a very suspicious ulcer was noticed in the throat, but the much dreaded agranulocytosis did not make its appearance. Crystals of sulphapyridine appeared in the urine of three patients but these soon disappeared after the giving of copious drinks. A morbilliform rash was seen in three cases. The longest period between the onset of the illness and the first dose of sulphapyridine was nineteen days (an example of a pre-existing chronic septicæmic form) and the shortest was under twenty-four hours, the average being 2.3 days.

The drug tended to initiate vomiting in those who had not vomited earlier and to exaggerate the sickness in those who had.

#### EFFICACY OF CHEMOTHERAPY.

The rapid amelioration of the patients' general condition is now well known and is nothing short of miraculous. The comparative absence of any permanent disability is also another welcome feature of the introduction of sulphonamide derivatives. From a military or Service aspect these drugs have proved themselves of inestimable value in that, once a patient is well under the influence of the drug, he can be moved from a forward unit to one further back by ambulance car or train, without detriment to his ultimate recovery. The headache appeared to be exaggerated by the movement during such transfer, but, on recovery, the patients have said they could remember nothing of it. Similarly, cases can be transferred, if necessary,

to hospitals overseas at a much earlier period than was formerly possible. This was of enormous help to us at the times when available bed accommodation was short and emergency evacuations were ordered. Chemotherapy has also enabled us to send convalescent patients to a Convalescent Depot instead of sending them on sick leave. Unfortunately for this report many patients were sent to United Kingdom as emergency evacuation cases to continue their hospital convalescence. Of the 50 who were sent to the Convalescent Depot in France, 46 were examined by me at varying periods of their stay there. Three men said they had rather annoying headaches at times and one or two complained of some pain at the site of lumbar puncture. Aided, however, by the example of the remainder who made an obviously perfect recovery, these men also got quite well and went back to duty.

Sulphapyridine also proved of value in causing the disappearance of meningococci from the nasopharynx. The throat swabs of nearly 30 patients, previously meningococcus positive, became negative after a course of sulphapyridine in 1 gramme doses six-hourly for one day and eight-hourly for six days. Unfortunately, my records of these were lost and I have to quote from memory. In this respect sulphapyridine seemed more efficacious than sulphanilamide, but treatment of a larger series by alternative methods is necessary before definite judgment can be given. Gargles, spray, and applications of sulphapyridine to the nasopharynx were completely valueless.

Finally, the greatest boon is the effect of the sulphonamide derivatives on the mortality which before their discovery was anything up to 80 per cent.

#### MORTALITY.

In this series there were two deaths but neither of them was due directly to the effects of the meningococcus. One died six weeks after the onset from an ascending infection consequent upon necessary and repeated catheterization for retention of urine. The second died from bronchopneumonia and pericarditis with effusion and adhesions, not of meningococcal origin. There were some patients who were brought to a medical unit either dead or moribund or in too far an advanced state to be able to respond to chemotherapy. These are not included in this series. The mortality from this disease for the whole of the British Expeditionary Force for 1939 to April 22, 1940, is as under :—

For the first 98 cases mortality was 16·3 per cent (16 deaths).

For the next 92 cases mortality was 3·3 per cent (3 deaths).

For the last 31 cases mortality was 3·2 per cent (1 death).

The rather high percentage in the first 98 cases is accounted for by the fact that in the early period, when our own units were not completely opened, cerebrospinal fever patients were sent to the nearest French civil hospitals in many of which they received treatment by anti-meningococcal

serum and repeated lumbar puncture and not by chemotherapy; partly too, by the difficulty experienced and the delay in finding the location of the hospitals, the drivers of ambulance cars being quite unfamiliar with the localities and in part also by some delay in diagnosis for reasons already referred to. The very marked fall from 16·3 to 3·2 per cent is due, I am sure, to the earlier recognition of the disease and to the universal adoption of chemotherapy in our own units, which were by this time fully prepared to receive patients.

#### NOTES.

*Special Types of Onset.*—The onset may resemble that of subarachnoid hæmorrhage in those cases where sudden headache is associated with drowsiness or a semi-comatose state of varying and perhaps alternating intensity. Fortunately, both conditions lead to the performance of lumbar puncture when the correct diagnosis is arrived at. In the above series one patient was thought to be suffering from diabetic coma because of the presence of sugar in a catheter specimen of his urine. He was given insulin and glucose in suitable dosage but later some nuchal pain and rigidity suggested the advisability of lumbar puncture, when the true condition became evident. He did well with sulphapyridine alone. Ward and Driver (1940) reported a similar case. Glycosuria as an unusual sign of cerebrospinal fever is mentioned by Osler. Presumably it is due to some pressure or disturbance in the floor of the 4th ventricle for in Ward and Driver's case the 7th cranial nerve was affected while, in mine, the 8th was temporarily involved.

An early symptom may be intense hyperæsthesia of any part of the body, limb or extremity. Exquisite tenderness of the scalp was a marked feature in one of my patients.

The chronic septicæmic or pre-cerebrospinal form is very frequently diagnosed myalgia, muscular rheumatism or erythema nodosum. It has also been confused with trench fever because of pain in the lower limbs, the presence of pink spots and an irregular fever. This form may last for days, weeks, months, or years, and influenza, pyrexia of uncertain origin, enteric fever, malaria, latent tuberculosis are common diagnostic labels attached to the condition. The number of cases of the chronic septicæmic form I saw in France together with those I have seen during the past few months in the hospitals of the United Kingdom confirm the conclusion of Kennedy (1926) that the prevalence of meningococcal septicæmia is not yet well recognized in spite of the attention called to it in a more recent publication by Stott and Copeman (1940), who also note that this form of the disease becomes more common whenever meningococcal meningitis is present in a community. It is well known that the chronic septicæmic form may terminate at any time in the cerebrospinal form. It is quite conceivable that these chronic types may be "blood-carriers." Just as *B. coli* and *B. typhosus* may pass from blood to urine through inflamed or damaged renal tissue, so may meningococci leave the blood to pass into the secretion from



an inflamed nasopharynx. In this event, the disease may be spread by the "droplet" method.

*Physical Signs.*—Physical signs which I have not seen described hitherto are hæmorrhages beneath the conjunctivæ resembling that which is sometimes seen in whooping-cough; subcutaneous hæmorrhage with the formation of "blood-blisters"; submucous (palatal) hæmorrhage and engorgement or "streaking" of the small vessels running between the outer or inner canthus and the margin of the cornea, as is sometimes seen in typhus fever. Hæmorrhages of this kind are not mentioned by Osler; neither were they noted by medical officers in the field medical or record cards. As the hæmorrhages were so obvious at the time of my examination, they must be late signs. It is therefore probable that they are connected with the sulphapyridine and may be due perhaps to the deposition of crystals of the drug in the smaller vessels, as is seen in the hæmaturia associated with the presence of sulphapyridine crystals in the small vessels of the kidney. Williams and Brinton (1940) also reported ecchymoses, subconjunctival and submucous hæmorrhages in their series of 45 cases.

It is said that respirations are increased only when there is some pulmonary involvement. An increase of respirations to 40 or more per minute was observed in one of my series. Another patient, not included in the series, whom I saw with Colonel Stott, also exhibited this feature. There was no pulmonary complication discovered and the cause was considered to be central or medullary in origin.

Brudzinski's sign, which in my view is a most valuable sign of meningitis, was reported in 10 instances only. I am sure that if looked for, the sign would have been found in a far greater proportion of cases. Kernig's sign was, however, reported in 133 instances.

The type of fever is in no way characteristic; in the above series two patients remained afebrile throughout. Collapsed and dehydrated patients may show no fever until they have been resuscitated.

It was found in a certain number of convalescent patients who had received adequate treatment by sulphapyridine that meningococci could still be cultured from the nasopharyngeal swab. Were these meningococci the same organisms that had caused the attack? If so, they must have survived the action of the sulphapyridine. Or, were they superimpositions of fresh organisms upon a convalescent mucous membrane? Further research is necessary before these questions can be answered. Carriers, generally, cleared up rapidly upon giving sulphapyridine by mouth; local applications of the drug to the nasopharynx in the form of sprays, insufflations and gargles proved quite valueless.

#### REFERENCES.

- KENNEDY, J. C. (1926). *Journal of the Royal Army Medical Corps*, **47**, 6.  
STOTT, A. W., and COPEMAN, W. S. C. (1940). *Lancet*, **1**, 1116.  
WARD, C. W., and DRIVER, A. A. (1940). *Ibid.*, **2**, 228.  
WILLIAMS, D., and BRINTON, D. (1940). *Ibid.*, **2**, 482.

## REORGANIZATION OF A FIELD AMBULANCE.

BY LIEUTENANT-COLONEL H. L. GLYN HUGHES, *D.S.O., M.C.*,

*Royal Army Medical Corps.*

FOLLOWING the return of the British Expeditionary Force from France and Flanders, one was immediately faced with the probability of encountering very different problems in active warfare in this country. To deal with these it was apparent that the normal organization of a Field Ambulance, with a Headquarters Company and two Bearer Companies, and moving as such, presented great difficulties in effecting that mobility which was so essential in the operations likely to be undertaken.

On consideration, too, of the recent fighting in France and Flanders, with its constant change and rapid movement, due of course to the advent and development of the Armoured Fighting Vehicle, it was felt that this would become a constant factor in all future warfare, and therefore any change in the composition of a Field Ambulance that would increase its mobility would be of inestimable value.

With the altered type of warfare and the emergencies likely to be encountered, whether isolated attacks by groups of A.F.V.s, possibly by attempted invasion from the sea at a large number of points simultaneously, or by parachute landings in force, or landings by troop carriers, it is obvious that to deal with the large number of eventualities that might arise in a Divisional, or even in a Brigade area, the orthodox arrangement of a Field Ambulance as laid down must be capable of being changed, and it is with this object in view that the following suggestions are made, both in the sub-division of the companies and in the method of loading. At the same time, the original composition as laid down can be adhered to if required.

The scheme, as formulated, has been based on the subdivision of the present Headquarters and two Bearer Companies, and the loading tables on the present scale of G.1098 Ordnance, and I.1248 Medical Equipment, with the two main essentials, mobility and speed, in view throughout. It is felt, however, that if any further alterations are to be made in the scale of equipment, certain articles could be left out with great advantage in mobility and without detracting in any way from the scope, protection, or usefulness of the Field Ambulance.

I propose to deal first with the suggested rearrangement of the personnel and, with this, the method of reloading, to show that by this means not only can a Field Ambulance deal with any emergency that may arise, necessitating the detachment of a small self-contained section, but also that all personnel can now be carried in the loaded vehicles of a Field Ambulance. It has always been a major difficulty in the movement of a Field Ambulance by road, that it is impossible to carry 50 to 60 men in the unit transport,

and this was never more apparent than during the recent operations in France and Flanders.

There may exist difficulties in the varying size of vehicles supplied to units but the proposed plan is based on the establishment laid down, of four 3-ton lorries and fifteen 30-cwt. lorries, and from the loading tables it will be seen that ample margin has been allowed to prevent overloading. (In the case of personnel, an allowance of  $7\frac{1}{2}$  pounds per man has been given in excess of the normal scale). Weights of equipment have been taken in some cases from "Notes for Field Ambulance Commanders" and, where there has been any doubt, as well as in the case of all G.S. and Improvised Panniers and Cases, actual weighing has been carried out.

The proposed rearrangement of a Field Ambulance consists of splitting up each Bearer Company into a Company Headquarters Light Mobile Section and two other Light Mobile Sections, whilst the Headquarters Company is divided into two Sections, one Light, comparable to those of the Bearer Companies, and a Heavy Section which can still fulfil the original function of the Headquarters Company and form a Main Dressing Station. The splitting up of the Field Ambulance Headquarters Company has been done so that in an emergency a Field Ambulance Commander would have at hand a section which he could detach at a moment's notice, either as a replacement, a reinforcement, or to undertake some new unexpected operational role.

The splitting up of the Bearer Companies into three has been done almost equally, both in personnel and equipment, with the result that a Bearer Company can now function either in its entirety as before, or in two or three sections as required by the situation.

The strength of the Company Headquarters Light Mobile Section and of each of the other Company Light Mobile Sections is 1 officer and 21 other ranks. These are made up as follows :

Company Headquarters Light Mobile Section						Company Light Mobile Section	
1 Officer (Coy. Commander) ..	..	..	..	..	..	1 Officer	
1 S/Sjt. R.A.M.C. ..	..	..	..	..	..	1 Sjt. R.A.M.C.	
1 Cpl. Clerk R.A.M.C. ..	..	..	..	..	..	1 Cpl. R.A.M.C.	
16 Ptes R.A.M.C. ..	..	..	..	..	..	16 Ptes. R.A.M.C.	
3 Dvrs. R.A.S.C. (incl. Cpl.) ..	..	..	..	..	..	3 Dvrs. R.A.S.C.	

The Light Mobile Section of the Field Ambulance Headquarters Company varies very slightly, and has 1 Officer, 2 Serjeants, 18 Privates R.A.M.C., and 2 Drivers R.A.S.C. The distribution of these will be seen clearly set out in the personnel loading table (Appendix A).

The secret of the ability to carry all the personnel of a Field Ambulance lies in the method of distribution of the vehicles amongst the companies and their loading, to meet the requirements of the Light Mobile Sections and the Company Headquarters Light Mobile Section. It is done as follows.

Each Light Mobile Section is given two 30-cwt. lorries, whilst Company Headquarters Light Mobile Section has one 3-ton lorry. This leaves for the

Headquarters Company seven 30-cwt. lorries, and two 3-ton lorries. Of these, two 30-cwt. lorries go to the Headquarters Company Light Mobile Section, as in the case of the Bearer Companies, and the remainder are sufficient to meet the needs of the Headquarters Company Heavy Section. Of the remaining five 30-cwt. lorries, one is allotted solely to the Q.M. Stores, one to workshops and one to the cooks. It is proposed that normally all three water-trailers should be attached to 30-cwt. lorries of Headquarters Company Heavy Section, but it is felt that it would be advisable for one lorry of each light mobile section to be fitted so that a trailer could be attached in case of necessity.

To give a complete list of all the load tables would, I feel, make this article much too unwieldy but they are available if required. Appendix B. does, however, give a specimen of the loading of a Light Mobile Section and Appendix C. is designed to show the total weight tables of all the vehicles with the number of personnel carried in them, and that there has been no overloading. The question of reserve rations is solved by splitting them up between the sections and three days in amount can be carried quite easily.

In dealing with the loading of a Light Mobile Section, it may be pointed out that two different methods have been practised ; in the first, the equipment has been split equally between the two 30-cwt. lorries of the section and ten men carried in each ; in the other, practically all the equipment has been placed in one lorry, allowing for the carriage of only six men, while the other contains only anti-gas equipment, thereby enabling fourteen men to be transported. There are arguments for and against both methods. In the one case it is felt that all one's eggs are not in one basket, in the other, that the anti-gas equipment, which might be needed in a great hurry, is more easily accessible. By the latter means, too, a lorry is readily available for the collection or transport of lightly wounded casualties, should it prove necessary.

It is really essential to have in front of one the complete loading tables of all the vehicles to appreciate the varying allotment of the panniers, both Medical and G.S., and the methods devised to supplement them where necessary. In the Headquarters Company the Light Mobile Section is provided with panniers by improvisation and by the re-distribution of the G.S. panniers as a whole. For instance, G.S. pannier No. 8 has been split up largely between Nos. 2 and 7 ; Nos. 11 and 12 have been amalgamated. This provides for the following arrangement for panniers for the Light Mobile Section :—

- No. 11 becomes No. 1 (Nursing).
- No. 2 remains No. 2 (Cooking).
- No. 8 becomes No. 3 (Medical and Surgical Equipment.)

A and B Companies have necessarily had to split up the contents of their G. S. panniers to equip their Light Mobile Sections. As regards the Field Ambulance panniers their distribution can be done in various ways. They

can either be kept with the Company Headquarters section as a reserve and their place taken by improvised cases of equipment, or the F.A. pannier No. 2 can be given to one section, and the reserve dressing box and medical companion to the other.

The aim of my division and re-distribution has been to provide for the two main essentials of mobility and speed and, by the method suggested, it is contended that a company can be split rapidly and made use of in many different ways ; in fact one or more Light Mobile Sections can even be detached whilst on the line of march as a self-contained unit, ready to function at a moment's notice without any adjustment of equipment being necessary.

The varying tactical problems that might have to be met are innumerable ; for instance, one of the companies might be called upon to operate with a single battalion, or a mobile column on an extended front, and in this case the two Light Mobile Sections of a company could form Advanced Dressing Stations or Advanced Collecting Posts whilst the Company Headquarters could remain in reserve and reinforce either as necessary. In another case, the Company Headquarters Light Mobile Section and one Light Mobile Section might remain together, with Company Headquarters opened up, the Light Mobile Section with it remaining closed, ready to move forward in the event of any sudden advance. This method of leap-frogging has been practised frequently in Brigade and Divisional Exercises and has proved its worth in the ability of a Section or Sections to be kept open continuously whilst others are moving forward. Where you have possibly another situation, such as the defence of a number of widely separated A.P.s, perhaps 10 miles apart, and each the responsibility of an infantry battalion or similar unit, then the detachment of a Light Mobile Section solves a very difficult problem and ensures adequate medical help.

The advantage of this sub-division of a Field Ambulance, whether in the advance or withdrawal of a formation such as a Brigade Group, has certainly proved its value in practice and would, I feel, do so in actual war conditions. In an advance, a Light Mobile Section can move behind the leading battalion and, consisting of very few vehicles, can do so without hampering following troops, at the same time saving considerable time in the treatment and evacuation of casualties, when compared with the usual procedure of a Field Ambulance moving as a whole near the rear of the Brigade convoy. In a withdrawal it would enable a medical unit to remain with the rear guard throughout and, by leap-frogging, certain sections can be rested while the evacuation of all casualties can be assured, always a difficult procedure when a unit which has not complete mobility has to be withdrawn, at any rate in part, earlier in the proceedings than would be necessary under the suggested scheme.

There are endless possibilities with this arrangement and it does not preclude the companies working as a whole or split into two or three, whereas it makes for considerably increased mobility and speed in the evacuation of casualties.

There is one point that I should like to emphasize and that is that, to ensure smooth working, a great deal of practice is necessary. Each officer and N.C.O. should be trained to take the individual responsibility necessary for success. I have found that Field Ambulance exercises can now be made very much more interesting and tactical situations introduced more easily. The command of the Field Ambulance and the Companies is circulated amongst the officers and N.C.O.s. Others are utilized as umpires and all given training in responsibility and initiative.

Normally, each Light Mobile Section consists of two 30-cwt. lorries and, when available, an officer's 8-h.p. Austin car. The question of distribution of ambulance cars, of necessity, depends on the tactical situation, but on the line of march one ambulance car always travels with each Light Mobile Section in case it has to be detached at a moment's notice. In the event of operations a pool can be formed at the Field Ambulance Headquarters and the cars distributed as required.

Owing partly to the fact that, during the recent fighting, ambulance cars seemed to enjoy a priority as regards dive-bombing attacks from the air and machine gun fire from the ground and partly to the very wide area likely to be covered in the operations envisaged, it is felt that the normal establishment of ambulance cars in a Field Ambulance should be raised to 12. In the same way a larger number of motor cycles would be invaluable to ensure adequate intercommunication between the Light Mobile Sections and Field Ambulance Headquarters. Ten in all, in place of the present establishment of five, would be a convenient number. It is certainly imperative that there should be one per section and this would only leave Headquarters with its normal allotment of three.

It will be noticed in the personnel loading table that one motor cycle has been allotted to the Transport Officer. This would probably only be operative during an actual convoy drive or move of Field Ambulance Headquarters. On arrival this motor cycle would be returned to the Headquarters pool. It is essential, and is laid down, that there should be an officer mounted on a motor cycle during all moves in convoy. This also frees one two-seater car for the use of the liaison officer; in active operations the Dental Officer can be usefully employed for this duty.

There is one point which might be raised in discussing the allocation of one M.O. to each Light Mobile Section and that is that, in the event of a Main Dressing Station being required, there would be an insufficiency of medical officers. I think this is only a remote possibility. In this country the necessity for forming a Main Dressing Station will very rarely arise, owing to the large number of Hospitals, E.M.S., Military, and others, that are available. In other spheres it is unlikely that all seven Sections will be needed at one and the same time and it should be possible to utilize the medical officers of those Sections in reserve for this purpose.

These are suggestions that have been based on the necessity of providing medical aid in a large number of operational roles of varying types, likely

to be carried out by any mobile formation, and they have been practised in all kinds of exercises. It is certain that there must be very many improvements that can be made to this scheme but it has been put forward in the hope that it will form a basis for experiment and that suggestions will be forthcoming as a result. The writer would be extremely grateful for any new ideas and will willingly send a copy of the full loading tables to anyone that is interested.

#### SUMMARY.

(1) The experience of the present war to date, with its changed type of active operations, necessitates an alteration in the organization and loading of a Field Ambulance, to allow for increased speed and mobility.

(2) With the suggested alteration it is now possible to carry all the personnel of a Field Ambulance.

(3) With the proposed organization, a Field Ambulance is still capable of being used exactly as before but it can now, if required, be split up into seven Light Mobile Sections and one Heavy Section, capable of dealing with any emergency that may arise.

(4) If the establishment could be changed, an increase in the number of ambulance cars to twelve and motor cycles to ten would be of inestimable value. On the other hand, there are many articles both in the G. 1098 and I. 1248 equipment that could be dispensed with.

(5) The 3-ton lorries used in the above experiments were Thornycrofts, which have internal dimensions of 13 ft. 9 ins. by 6 ft. 9 ins., thus having a greater loading capacity than Bedford 3-ton lorries whose internal dimensions are 11 ft. by 6 ft. 3 ins.

#### APPENDIX A.

##### PERSONNEL LOADING LIST.

##### *Headquarters Company*

Humber 4-seater car, O.C...	..	..	1 Officer	..	1 R.A.S.C.	..	2 R.A.M.C.
One 2-seater car, 2nd i/c	..	..	1 Officer	..	1 R.A.C.S.		
One 2-seater car, Q.M.	..	..	1 Officer	..	1 R.A.S.C.		
One 2-seater car, L.O. (Dental Officer)	..	1 Officer	..	1 R.A.S.C.			

##### *H.Q. COY. Light Mobile Section.*

One 30-cwt. Lorry	..	..	..	1 Officer	..	1 R.A.S.C.	..	5 R.A.M.C.
One 30-cwt. Lorry	..	..	..	..	..	1 R.A.S.C.	..	15 R.A.M.C.

##### *H.Q. COY. Heavy Section.*

One 3-ton Lorry	..	..	....	..	..	1 R.A.S.C.	..	5 R.A.M.C.
One 3-ton Lorry	..	..	..	..	..	2 R.A.S.C.	..	7 R.A.M.C.
One 30-cwt. Lorry and Water Trailer	..	..	..	..	..	2 R.A.S.C.	..	4 R.A.M.C.
One 30-cwt. Lorry and Water Trailer	..	..	..	..	..	1 R.A.S.C.	..	4 R.A.M.C.
One 30-cwt. Lorry and Water Trailer	..	..	..	..	..	1 R.A.S.C.	..	5 R.A.M.C.
One 30-cwt. Lorry	..	..	..	..	..	1 R.A.S.C.	..	8 R.A.M.C.
One 30-cwt. Lorry (Workshops)	..	..	..	..	..	5 R.A.S.C.		
Eight Ambulance Cars	..	..	..	..	..	16 R.A.S.C.	..	8 R.A.M.C.

---

5 Officers	..	35 R.A.S.C.	..	63 R.A.M.C.
------------	----	-------------	----	-------------

---

*"A" and "B" COYS. (each) H.Q. Light Mobile Section.*

Humber 4-seater car	..	..	..	1 Officer	..	1 R.A.S.C.	..	2 R.A.M.C.
One 3-Ton Lorry	..	..	..	..	..	2 R.A.S.C.	..	16 R.A.M.C.

*Light Mobile Section.*

One 2-seater car	..	..	..	1 Officer	..	1 R.A.S.C.	..	
One 30-cwt. Lorry	..	..	..	..	..	1 R.A.S.C.	..	9 R.A.M.C.
One 30-cwt. Lorry	..	..	..	..	..	1 R.A.S.C.	..	9 R.A.M.C.

*Light Mobile Section.*

One 30-cwt. Lorry	..	..	..	1 Officer	..	1 R.A.S.C.	..	9 R.A.M.C.
One 30-cwt. Lorry	..	..	..	..	..	1 R.A.S.C.	..	9 R.A.M.C.

---

3 Officers	..	8 R.A.S.C.	..	54 R.A.M.C.
------------	----	------------	----	-------------

---

*"B" COY. only*

Motor Cycles	..	..	..	1 Officer	..	4 R.A.C.S.	..	
--------------	----	----	----	-----------	----	------------	----	--

---

GRAND TOTAL	..	..	..	12 Officers	..	55 R.A.S.C.	..	171 R.A.M.C.
-------------	----	----	----	-------------	----	-------------	----	--------------

---

Of an establishment of 177 Other Ranks (R.A.M.C. and A.D. Corps) at least 6 Other Ranks would be left behind for Guard Duties, and in the event of an operational move these could all be accommodated on various lorries without overloading.

The establishment of a FIELD AMBULANCE is as follows :—

		OFFICERS	O.R.'S.
R.A.M.C.	..	10	176
A.D. Corps	..	1	1
R.A.S.C.	..	1	55
		<hr/> 12	<hr/> 232

In addition there is :—

R.A.M.C. (1st line reinforcements)	..	7
	<hr/> 12	<hr/> 239

## APPENDIX B.

## LOADING TABLE OF A LIGHT MOBILE SECTION.

*Lorry No. 1. 30-cwt. Stores Lorry.*

Designation	Number	Weight
Haversacks, surgical	2	13
Haversacks, shell dressing	4	12
Bottles, water, medical, filled	5	50
Splints, Thomas, complete	3	15
Splinting, Cramers, lengths	5	3
Stretchers	10	255
Pillows, Stretcher	10	22½
Slings, S.B.	20	10
Bars, suspension	4	14
Blankets	20	90
Pyjamas, suits	10	22
Cases, Wooden, No. 2	1	40
Panniers, G.S. No. 4	1	90
Kerosene in containers, galls.	2½	45
Lamps, Hurricane, filled	1	4
Trestles, prs.	1	24½
Shovels, G.S.	1	3½
Pannier, Medical Comforts	1	90
Sheets, Ground	20	64
Stools, Camp	1	11
Tables, Camp, Mk. III	1	20
Covers, canvas	2	28



Designation	Number	Weight
Containers, 6 galls. . . . .	2	27
Insulators . . . . .	2	150
Containers, portable, 1 gall. . . . .	1	12
Containers, water, 2 gall. filled . . . . .	3	72
Kettles, Camp, 12 qt. . . . .	2	20
Pans, frying . . . . .	2	12
Stands, cooking . . . . .	2	30
Plates, battle . . . . .	2	8
Stoves, portable . . . . .	1	100
Containers, tin 2 gall. filled . . . . .	1	24
Axes, hand . . . . .	1	2
Axes, pick . . . . .	1	7½
Boxes, stationery, small . . . . .	1	80
Poles, flag, directing . . . . .	1	1½
Saucepans, Nests of 5 . . . . .	1	10
Petrol, Reserve, 8 galls. . . . .	—	64
One day's fresh rations for 22 men . . . . .	—	85½
Personnel, in full marching order . . . . .	6	1200
Medical Companion, improvised . . . . .	—	13
<b>Total Weight</b> . . . . .		<b>(lb.) 2844½</b>

*Lorry No. 2. 30-cwt. Personnel Lorry.*

Designation	Number	Weight
Cases, Wooden No. 1* . . . . .	1	119
Bags, contaminated clothing . . . . .	4	6
Capes, A.G. . . . .	27	54
Gloves, A.G. prs. . . . .	34	18½
Overboots A.G. prs. . . . .	6	48½
Jackets A.G. . . . .	3	1½
Trousers A.G. . . . .	3	1½
Gas, reserve, in bag . . . . .	1	8½
Petrol, Reserve, 8 galls. . . . .	—	64
Personnel, in full marching order . . . . .	14	2800
<b>Total weight</b> . . . . .		<b>(lb.) 3121½</b>

\* In this case, amongst other items, 2 days reserve rations for section would be carried.

## APPENDIX C.

## WEIGHTS CARRIED ON ALL LORRIES, COMPARED WITH FULL CARRYING CAPACITY.

Carrying capacity :—

3-ton Lorry . . . . .	6720 lb.
30-cwt. Lorry . . . . .	3360 lb.

## HEADQUARTERS COMPANY.

Heavy Section.	Weight carried
Lorry No. 1. 3-ton . . . . . 6 Men . . . . .	5168 lb.
Lorry No. 2. 3-ton . . . . . 9 Men . . . . .	5095½ lb.
Lorry No. 3. 30-cwt. . . . . 6 Men . . . . .	2899 lb.
Lorry No. 4. 30-cwt. . . . . 5 Men . . . . .	2401 lb.
Lorry No. 5. 30-cwt. . . . . 6 Men . . . . .	3264 lb.
Lorry No. 6. 30-cwt. . . . . 9 Men . . . . .	2515 lb.
Lorry No. 7. 30-cwt. . . . . 5 Men Workshops, Tools, &c.	1000 lb.

*Light Mobile Section.*

Lorry No. 1. 30-cwt. . . . .	7 Men . . . . .	3116½ lb.
Lorry No. 2. 30-cwt. . . . .	16 Men . . . . .	3200 lb.

## "A" COMPANY

*Headquarters Light Mobile Section.*

Lorry No. 1. 3-ton . . . . .	18 Men . . . . .	5956 lb.
------------------------------	------------------	----------

*Light Mobile Section I.*

									<i>Weight carried</i>
Lorry No. 1.	30-cwt.	..	..	10 Men	..	..	..	..	2953½ lb.
Lorry No. 2.	30-cwt.	..	..	10 Men	..	..	..	..	2981½ lb.

*Light Mobile Section II.*

Lorry No. 1.	30-cwt.	..	..	11 Men	..	..	..	..	3049 lb.
Lorry No. 2.	30-cwt.	..	..	10 Men	..	..	..	..	2953½ lb.

*"B" COMPANY.**Headquarters Light Mobile Section.*

Lorry No. 1.	3-ton	..	..	18 Men	..	..	..	..	5668 lb.
--------------	-------	----	----	--------	----	----	----	----	----------

*Light Mobile Section I.*

Lorry No. 1.	30-cwt.	..	..	6 Men	..	..	..	..	2831½ lb.
Lorry No. 2.	30-cwt.	..	..	14 Men	..	..	..	..	3121½ lb.

*Light Mobile Section II.*

Lorry No. 1.	30-cwt.	..	..	6 Men	..	..	..	..	2837½ lb.
Lorry No. 2.	30-cwt.	..	..	15 Men	..	..	..	..	3321½ lb.

## PHTHISIS FOLLOWING PLEURISY.

BY CAPTAIN W. LAURIE, I.M.S.

THIS paper records the results found in a six-months period of observation of fifty-eight soldiers of the Indian Army who developed pleurisy while serving in the Razmak Camp, Waziristan.

Primary idiopathic pleurisy is now regarded as a manifestation of latent tuberculosis. Due probably to the differences in the lengths of time that the patients have been observed, there is some difference of opinion among workers as to the probable numbers of pleurisies caused by latent tuberculosis; among those who regard tuberculosis as the cause in the large majority of cases of pleurisy are Boyd (1935), Maxwell (1938), McCrae (1932), and Tidy (1934), all of whom also agree that pleurisy with effusion should be regarded as being particularly suggestive of underlying tuberculosis. Ward (1940) points out the stress laid upon any history of pleurisy in the assessment of fitness of British Army recruits.

There is also general agreement that the usual methods of clinical examination of the chest are of little use in the detection of early lung tuberculosis; this is well brought out in the article by Cooper (1940) on the results of radiological examination of the chests of twenty-two thousand men of the Sixth Division, Second Australian Imperial Force. Similarly, microscopical examination of sputum may give a diagnosis of phthisis before the clinical signs are definite.

In view of the above, in February, 1940, the Deputy Director of Medical Services, Northern Command, India, issued instructions that all cases of pleurisy occurring in this Command should be given six months off duty, during which time a detailed observation would be made to record their progress with treatment and rest. This scheme was brought into operation in Razmak Camp, Waziristan, in March, 1940, and this article is a summary of the results obtained in individuals who were under my care.

### LIVING CONDITIONS OF THE PATIENTS.

For reasons of security it is not possible to give certain details of the camp but it may be said that Razmak is a permanent military camp in Waziristan, North-West Frontier, India, and is situated near the borders of Afghanistan at a height of 6,500 feet, in the bleak inhospitable Sulaiman Hills. In this camp the demands upon the soldiers are much more severe than is the case in the Plain Stations of India, both from the point of view of the climate to which the men are exposed and of the duties which they are called upon to perform. From the middle of November to the middle of March the climatic conditions are severe, with the minimum temperature

near or below freezing point, with frequent heavy rainstorms and snowstorms and with a bitterly cold wind. The local political situation is such that certain routine duties must be carried out regardless of the weather, and this often necessitates the soldiers lying for several hours in exposed positions in the hills without any protection from the elements. In the day's work, also, unusually heavy demands are made upon the lungs since the soldier has to scramble up and down hills as much as two thousand feet above the level of the camp itself.

Another factor to be taken into account is that of overcrowding; in this camp the garrison numbers some thousands of whom the majority are accommodated in one-storied barracks and all housed within an area of not more than two square miles. It is not possible to enforce the Army standard of three feet of space between adjacent beds, but the barrack rooms are so arranged that the head of one bed alternates with the foot of the next, so that the danger of droplet infection may be reduced as much as possible.

This danger of rapid spread of infectious disease among individuals living together in barracks is stressed by Radmilo (1939).

The conditions mentioned above are such that the results of this investigation may differ from those obtained in a similar investigation of patients living a less exposed and less strenuous life.

#### METHODS OF INVESTIGATION.

All of the fifty-eight individuals examined in this scheme were soldiers of the Indian Army. Only one of the patients had been recruited after the outbreak of the present war. The other fifty-seven had all been enrolled and had seen service in the Regular Indian Army before the beginning of the war and were all professional soldiers. The results of this investigation, therefore, may be taken as applicable to the peace-time Indian Army and should not be regarded as a special problem arising from any temporary lowering of recruiting standards. The different communities recruited for the Indian Army—Gurkha, Hindu, Mussulman and Sikh—were represented among the fifty-eight patients in a proportion in keeping with the numbers of each community in the camp and the figures from the different branches of the Service, such as Artillery, Infantry, etc., showed no significant variation. These points are mentioned to show that the results obtained are not due to the unfitness of men recruited for any special branch of the Army, nor are the results due to the unfitness for service of any one community, religious or social.

The treatment of the patient during his attack of pleurisy and the six-months follow-up after discharge from hospital were carried out in my wards in the Indian section of the Combined Military Hospital, Razmak. It was thus possible to standardize the treatment and the investigation.

Of the fifty-eight patients forty-eight suffered from primary idiopathic fibrinous pleurisy and the remaining ten suffered from pleurisy with effusion. In those patients suffering from fibrinous pleurisy the treatment while they

were in hospital was on general lines much like that of an early tuberculosis. The sputum of each patient was examined three times weekly in the clinical side room of the wards, and was sent once weekly for examination to the Waziristan District Laboratory. The patient's weight was recorded weekly. Due to a temporary shortage of X-ray films it was not found possible to X-ray more than sixteen of the patients during the stay in hospital. Eighteen more were X-rayed while on the follow-up course. All patients were kept in hospital until the disappearance of local signs and symptoms, until an increase had been recorded in the body-weight, and, in the case of those patients who had been admitted with low blood-pressure, the blood-pressure had risen to at least 110/75, and all secondary conditions such as anæmia had disappeared and until, in the exercise-tolerance test, the pulse-rate after exercise returned within one minute to a figure not more than ten beats per minute above the pulse-rate at rest. The exercise-tolerance test which we evolved was very similar to that recommended by the Horder Committee (1940). The sedimentation rate was also used in doubtful cases before they were discharged.

The average length of the stay in hospital of patients with fibrinous pleurisy was thirty-one days. The average number of sputum examinations per patient was sixteen, of which twelve were carried out in the clinical side room and the remaining four in the Waziristan District Laboratory.

Patients suffering from pleurisy with effusion were treated in much the same fashion as the individuals with fibrinous pleurisy except that they were retained in hospital until the effusion had absorbed or had been completely removed and had been replaced by air. All samples of fluid removed from the chest were sent to the District Laboratory for microscopical examination and for guinea-pig inoculation. The chests of five of these patients were X-rayed while they were in hospital and the remaining five were X-rayed during the period of observation. With this type of patient, the tests of fitness for discharge from hospital were exactly as used for the patients with fibrinous pleurisy.

The average stay in hospital of this type of patient was one hundred and four days with an average of forty clinical side room and sixteen District Laboratory examinations of sputum.

At the time of discharge of the patient from hospital, a follow-up form was made out for him, giving a synopsis of the history and the course of the disease. On this form were also entered the clinical findings, the weight, and the result of the sputum examination found at the routine weekly inspection of the patient. This routine weekly examination during the six months of observation took the form of a clinical examination of the chest, recording of the patient's weight, an exercise-tolerance test, and the recording of the blood-pressure. The patient was given, at the close of the examination, a sterile screw-capped glass container for sputum; he took this container away with him, and reported next morning with the bottle containing a twenty-four hour sample of sputum which was then sent

to the District Laboratory for examination. In some of the cases it was found necessary to X-ray the chest during this period of observation.

Patients were readmitted to hospital for conditions such as recurrence of local signs or symptoms and if, for three consecutive weeks, the weight had shown a decrease.

Our first intention had been to give the patient six months' rest after the attack of pleurisy but this arrangement was not carried out. The principle of the six months' rest period was that the patient, presumably suffering from latent tuberculosis, should not be exposed to severe exertion and climatic conditions before he had time to recover sufficiently to escape breaking down and becoming a frank phthisis. A principle of even greater importance to the Army, however, was the prevention of infection of healthy individuals by a patient with "open" tuberculosis. The best way of combining these two principles, namely the protection of the patient and the protection of the healthy contact, was by the introduction of a graduated scale of exercises for the convalescent patient to enable him to return to duty at the end of the convalescent period and at the same time to assist me to detect, while they were still under my control, those men for whom further service in the Army would have been harmful both to themselves and to the community. The exercises began in the first month with the patient being allowed to attend one lecture daily, provided that this lecture were in the open air, and by steady increments of duty these exercises had attained a standard approximating to about 80 per cent of normal duty by the end of the sixth month of the observation period, at which time the patient was sent back to full duty if no contra-indication had been found.

#### RESULTS OF INVESTIGATION.

Of the forty-eight individuals with fibrinous pleurisy, eleven (i.e. 23.8 per cent) developed "open" phthisis before the end of the period of observation. Three of these eleven patients had not been X-rayed and, of the seven who had been examined by X-rays, three showed X-ray evidence of phthisis. A note is given below on the reason for the small number of patients found positive by X-ray examination.

All of the eleven phthisis patients were detected as having tuberculosis on the results of the routine weekly examination of the sputum in the Waziristan District Laboratory.

On the average, the period at which these men broke down and began to show *Myco. tuberculosis* in the sputum was on the fifteenth week of the convalescent period.

A most disturbing feature of the finding of these patients with tuberculous lungs was that, at the time the microscopical diagnosis was made, eight of the eleven patients so diagnosed would have been passed as fit at any routine medical examination. They looked fit, they showed no clinical sign in the chest, their weights were not falling, and they themselves felt quite fit. It was with the greatest difficulty that these eight

apparently fit men could be persuaded that they were suffering from tuberculosis.

Another disturbing point was that, in four of these apparently fit patients, the diagnosis was made very late in the convalescent period. One patient was diagnosed in the twenty-fourth week, one in the twenty-fifth week, and two in the twenty-sixth week, just previous to the time when they would have been discharged as fit for full duty. This type of patient is the real danger to the Army.

The finding of *Myco. tuberculosis* in the sputum of the three remaining individuals was not unexpected and occurred coincident with the finding of X-ray signs of phthisis and with the appearance in the chest of clinical signs suggestive of phthisis. They broke down early in the convalescent period, one breaking down in the fourth week and two in the sixth week. (See Case Histories, Nos. 5, 9 and 10 below.)

Before the end of the observation period on the ten patients suffering from serous pleurisy, six (i.e. 60 per cent) of the ten were found to have *Myco. tuberculosis* in specimens of sputum sent for examination to the District Laboratory. All of these patients had been X-rayed but only in two was the diagnosis of lung tuberculosis supported by the reports on the chest radiograms. As in the case of the eleven fibrinous pleurisies, the diagnosis was made by the District Laboratory staff from the routine weekly samples of sputum.

The average time of breaking down of the six patients was in the eleventh week. Other facts which should be borne in mind in assessing the prognosis of these pleurisies with effusion are that the ten individuals with serous pleurisy were the least unfit of a series of sixteen patients, the other six having been discharged from the Army as being obviously unfit for further service. There was no such choosing of patients in the series of fibrinous pleurisies. These ten individuals had spent very much longer in hospital than had the patients suffering from fibrinous pleurisy, the average times being 104 days and 31 days respectively. At the end of the six months' convalescence two of the patients with effusion had been fully twelve months off duty. These ten patients were not given steady increments of duty each month as were the patients with fibrinous pleurisy. In fact, at the end of the six months of observation, the majority of these patients with pleurisy and effusion had reached a stage of exercises which the fibrinous type of patient was given at the end of the first month of convalescence. It was necessary, therefore, to extend the period of convalescence to nine months for the patients of this type.

In two of the patients with effusion the diagnosis of phthisis was unexpected, as the progress had been satisfactory, but the remaining four individuals had been unsatisfactory throughout and had been expected to break down.

The system, on the finding of *Myco. tuberculosis* in a sputum, was that the patient was readmitted to hospital and segregated until the diagnosis

had been confirmed by the finding of the causative organism in at least three separate twenty-four hour specimens of sputum ; no man was diagnosed on one sputum examination. These three samples of sputum for confirmation were taken with precautions which ruled out any possibility of substitution of a sputum known to contain *Myco. tuberculosis*. Further precautions were also taken in the District Laboratory where each specimen of sputum was examined and reported on independently by the Deputy Assistant Director of Pathology of the District and by one of his staff. A further precaution was that many of these sputa were sent to the Laboratory under assumed names. These precautions were carried out to protect the patient against a casual diagnosis and not because we feared any attempt at malingering. This question of malingering did not arise because, with one exception, our patients were professional soldiers, making the Army their career, and to them the diagnosis of tuberculosis was a severe blow. Some of the patients were looking forward to gratuities, some to pensions and some to promotion. An example of the patients' reactions to the diagnosis is the case of a havildar (serjeant) who felt and looked fit and when told that he was suffering from phthisis said that his sputum must have been faked and insisted on taking other specimens of sputum to the District Laboratory himself and waiting there until they had been examined.

All specimens of fluid removed from the chests of the patients with effusion were submitted for investigation and all proved sterile on direct microscopic examination and on guinea-pig inoculation.

Fourteen of the seventeen patients diagnosed as tuberculosis had radiograms taken of their chests ; in five patients the diagnosis was confirmed. This small percentage of confirmation was probably due to the fact that screening of the chests was not possible. The District Radiologist is stationed seventy-two miles from Razmak and the only method open to us was to have the chests X-rayed by our technician and the films sent to the radiologist for opinion. I have discussed the matter with the radiologist who pointed out that, without screening of the patient, it is difficult to diagnose an early stage of phthisis from one X-ray film of the chest. Full radiological investigation would probably have allowed us to make a diagnosis of phthisis in some of the patients before the sputum became positive ; this would probably have been the case with the patients Nos. 5, 9 and 10 below.

Below is given in some detail the case histories of the seventeen patients who developed " open " phthisis during the period of observation.

#### CASE HISTORIES.

##### *Fibrinous Pleurisy.*

(1) Sikh Sepoy, aged 30, ten years' service.

Admitted to hospital with fibrinous pleurisy over the nipple area, left side of chest, of two days' duration ; the local signs and symptoms persisted for twenty days after the admission of the patient to hospital.

Weight on admission was 108 lb. (Height 5 ft. 6 in.)



Blood-pressure was 110/68.

X-ray examination of the chest was not carried out.

Poor exercise-tolerance.

Patient discharged after thirty-eight days in hospital, with weight 109 lb. and blood-pressure 120/80.

Except for the weight, which remained about 110 lb. throughout, the convalescence was satisfactory and the patient appeared to have completely recovered when, on the last week of his convalescence, and twenty-six weeks after discharge from hospital, he was found to have sputum containing *Myc. tuberculosis*.

(2) Sikh Sepoy, aged 23, five years' service.

Admitted to hospital with fibrinous pleurisy mid-axillary area, nipple level, left side chest, of twelve hours' duration. Local signs persisted for twenty-one days.

Weight on admission was 138 lb. with blood-pressure 110/70 and height 5 ft. 9 in.

X-ray examination of the chest was not carried out.

Exercise-tolerance was unsatisfactory.

Patient was discharged after thirty-five days in hospital with weight 142 lb. and blood-pressure 120/80.

Convalescence was satisfactory, with weight increasing until the sixth week of convalescence, when a recurrence of pleurisy was found in the part of the chest originally affected. The patient was readmitted to hospital with weight 145 lb. and blood-pressure of 110/80. The local condition cleared up after six days. The patient was kept in hospital for twenty-three days for this second attack.

Convalescence again proceeded satisfactorily with steady increase in weight until the last week of the convalescence when the sputum was found to be positive.

(3) Sikh Sepoy, aged 36, fourteen years' service.

Admitted with fibrinous pleurisy right mid-axillary line, nipple level, of fourteen days' duration.

Local signs persisted for fifteen days.

Weight on admission was 114 lb. (Height 5 ft. 10 in.)

Blood-pressure 125/85.

X-ray examination not carried out.

Exercise-tolerance satisfactory.

Patient was discharged after twenty-six days in hospital with weight 118 lb.

Progress was satisfactory with increase of weight and the patient apparently fit when *Myc. tuberculosis* were found in the sputum on the twenty-fourth week.

(4) Sikh Sepoy, aged 25, eight years' service.

Admitted with fibrinous pleurisy nipple area right side of chest of two days' duration. Attack was very mild and local signs disappeared after the patient had been two days in hospital.

Weight on admission was 109 lb. (Height 5 ft. 9 in.)

Blood-pressure 100/75.

X-ray examination of the chest was not carried out.

The exercise-tolerance was satisfactory.

Patient was discharged after twenty-four days in hospital, with weight 114 lb. and blood-pressure 115/75.

Except for a loss of two pounds in weight, the patient's progress during convalescence was satisfactory and he was regarded as almost fit for duty when he was found to be passing *Myc. tuberculosis* in his sputum on the twenty-fifth week, one week before discharge to duty.

(5) Hindu Sepoy, aged 30, eleven years' service.

Admitted with fibrinous pleurisy anterior axillary line, nipple level, right

side chest, of three days' duration. The signs and symptoms cleared up after nineteen days in hospital.

Weight on admission was 118 lb. (Height 5 ft. 7 in.)

Blood-pressure 115/80.

Report on X-ray film of chest was that the pleura in the mid-zone right lung was thickened but there was no evidence of phthisis.

Exercise-tolerance was good.

Patient was discharged after twenty-three days in hospital with weight 121 lb.

Convalescence was satisfactory, until the tenth day, when the patient complained that he felt weak; from that time on there was a steady loss of weight and it was not unexpected when on the fourth week of the course the patient was found to have a positive sputum.

(6) Hindu Mule Driver, aged 32, thirteen years' service.

Admitted with fibrinous pleurisy over the whole of the right side of chest and with moist sounds at the base of the right lung; there was a history of blood-streaking of the sputum.

The local condition cleared up after twenty-one days' stay in hospital.

Weight on admission was 108 lb. (Height 5 ft. 6 in.)

Blood-pressure was 120/80.

X-ray examination of the chest was not carried out while the patient was in hospital.

Exercise-tolerance was poor.

Patient was discharged after thirty days in hospital, with weight of 110 lb.

The convalescence ran an unsatisfactory course but it was not until the sixteenth week of convalescence that *Myco. tuberculosis* were found in this patient's sputum.

X-ray examination of the chest on the fifteenth week also showed evidence of tuberculosis in the middle lobe right lung.

(7) Sikh Sepoy, aged 22, three years' service.

Admitted with fibrinous pleurisy, left mid-axillary line of left side of chest, very localized and mild, of seven days' duration. This local condition cleared up within three days.

Weight on admission was 126 lb. (Height 5 ft. 6 in.)

Blood-pressure 120/70.

X-ray examination of the chest showed no abnormality.

Slight degree of anæmia found.

Exercise-tolerance good.

Patient was discharged from hospital after thirty-two days with weight 128 lb.

Convalescence was satisfactory, and the patient appeared to be almost fit when the sputum was found to contain *Myco. tuberculosis* on the sixteenth week of the observation period.

(8) Hindu Sepoy, aged 30, thirteen years' service.

Admitted to hospital with fibrinous pleurisy, posterior axillary line nipple level, left side of chest, of some days' duration. Local signs persisted for forty days.

Weight on admission was 138 lb. (Height 5 ft. 4 in.)

Blood-pressure 110/75.

X-ray examination of chest showed no sign of phthisis while the patient was in hospital.

Severe degree of hyperchromic macrocytic anæmia with 2,900,000 red cells and 60 per cent hæmoglobin.

Exercise-tolerance poor (due to the anæmia).

Patient discharged after seventy-two days in hospital, weight 143 lb.

Convalescence was proceeding satisfactorily until the ninth week when the sputum was found to be positive.

X-ray examination of the chest on the ninth week confirmed the diagnosis of phthisis.

(9) Hindu Sepoy, aged 33, thirteen years' service.

Admitted with fibrinous pleurisy over the lower lobe left lung. The local condition cleared up after fifteen days in hospital.

Weight on admission was 92 lb. (Height 5 ft. 11 in.)

Blood-pressure was 100/70.

X-ray examination of chest showed no pulmonary lesion.

Exercise-tolerance poor.

Patient was discharged from hospital after thirty days, with weight of 103 lb. and blood-pressure of 118/76.

Convalescence was very unsatisfactory and it was not unexpected when *Myco. tuberculosis* were found in the sputum on the ninth week.

(10) Hindu Mule Driver, aged 19, three months' service.

Admitted to hospital with mild fibrinous pleurisy mid-axillary line left side chest, of six days' duration. These local signs persisted for seventeen days.

Weight on admission was 112 lb. (Height 5 ft. 9 in.)

Blood-pressure was 130/85.

X-ray films of the chest, taken while the patient was in hospital, did not show any phthisis.

Exercise-tolerance poor.

The patient was discharged after a stay of thirty-three days in hospital, with weight 117 lb.

On the second week of the follow-up course, the patient developed a recurrence of the local symptoms in the left side of the chest with a very localized area of friction over that area. This second attack cleared up within a few days and the patient was again sent out after seventeen days in hospital.

Convalescence continued in an unsatisfactory manner, with falling weight and blood-pressure, which latter finally reached a low value of 100/74. (Compare the blood-pressure value of 130/85 when the patient was first admitted to hospital.) At this stage, on the sixth week of convalescence, the sputum was found to be positive.

X-ray examination of the chest confirmed the diagnosis at this stage.

(11) Hindu Sepoy, aged 26, five years' service.

Admitted to hospital with fibrinous pleurisy, nipple area, right side of chest, of three days' duration. The local signs persisted for thirty-one days.

Weight on admission was 136 lb. (Height 5 ft. 8 in.)

Blood-pressure 110/75.

The report on the chest X-ray photograph stated that it showed no evidence of pulmonary tuberculosis.

Exercise-tolerance was poor.

Patient was discharged after forty-two days in hospital, weight 139 lb.

Convalescence was satisfactory, with the weight rising, until the fourth week, when the sputum was found to contain *Myco. tuberculosis*.

#### *Pleurisy with Effusion.*

(12) Sikh Sepoy, aged 21, three years' service.

Admitted with serous pleurisy left side of chest of eight days' duration; the fluid level extended to the third rib. The fluid was aspirated and replaced by air

on eight occasions. All specimens of fluid were found to be sterile on direct microscopical examination and on guinea-pig inoculation.

After 180 days the fluid cleared up.

Weight on admission was 126 lb. (Height 5 ft. 10 in.)

Blood-pressure 100/72.

The X-ray photograph of the chest did not show any phthisis.

Exercise-tolerance was poor.

The patient was discharged after 224 days in hospital with the weight 134 lb. and the blood-pressure 115/78.

Convalescence was unsatisfactory and on the sixth week the sputum of the patient showed *Myco. tuberculosis*.

(13) Mussulman Sepoy, aged 24, six years' service.

Admitted with serous pleurisy of left side of chest, with fluid to level of fourth rib, all of one month's duration. The fluid was aspirated seven times and was found on each tapping to be very hæmorrhagic in appearance; all samples were sterile on direct microscopic examination and on inoculation of guinea-pigs. The fluid resolved after 116 days.

Weight on admission was 136 lb. (Height 5 ft. 11 in.)

Blood-pressure was 100/70.

Radiograms of the chest did not show any sign of phthisis.

Exercise-tolerance poor.

Patient was discharged after 182 days in hospital with weight of 145 lb. and blood-pressure of 110/80.

Convalescence was not satisfactory and the finding of the tubercle bacillus in the patient's sputum on the eighth week was not unexpected.

(14) Gurkha Rifleman, aged 28, eleven years' service.

Admitted to hospital with serous pleurisy of right side of chest with fluid up to the level of the fifth rib. History of one week's duration. Fluid was aspirated twice and was sterile on examination by microscope and by guinea-pig inoculation. The fluid cleared up after forty days.

Weight on admission was 109 lb. (Height 5 ft. 3 in.)

Blood-pressure was 105/76.

Radiograms of the chest at this stage did not show any signs of phthisis.

Patient's exercise-tolerance was poor.

Patient was discharged after eighty-four days in hospital with weight 117 lb. and blood-pressure 115/80.

Convalescence was not satisfactory and on the sixteenth week tubercle bacilli were found in the sputum.

(15) Mussulman Sepoy, aged 32, thirteen years' service.

Admitted with serous pleurisy of right side of chest of ten days' duration with the fluid level up to the sixth rib. Fluid was aspirated on one occasion and was found to be sterile both on microscopic examination and on guinea-pig inoculation. It cleared up in twenty-nine days.

Weight on admission was 123 lb. (Height 5 ft. 11 in.)

Blood-pressure was 120/75.

X-ray examination of the chest, taken during the patient's stay in hospital, showed no sign of phthisis.

Exercise-tolerance was poor.

Patient was discharged after fifty-six days in hospital with weight 129 lb.

Convalescence was satisfactory and the patient appeared to be progressing rapidly when his sputum was found to contain *Myco. tuberculosis* on the eighteenth week.

X-ray films taken at this time showed signs suggestive of phthisis.

(16) Hindu Gunner, aged 27, nine years' service.

Admitted to hospital with serous pleurisy right side of chest of two days' duration ; the fluid level was at the sixth rib. No aspiration was carried as this fluid absorbed spontaneously by the twentieth day.

Weight on admission was 124 lb. (Height 6 ft. 0 in.)

Blood-pressure was 120/80.

X-ray examination of the chest showed no sign of phthisis.

Exercise-tolerance poor.

Patient was discharged after forty-nine days in hospital with weight 131 lb.

Convalescence was proceeding slowly but satisfactorily when tubercle bacilli were found in the sputum on the sixth week.

(17) Hindu Sepoy, aged 25, six years' service.

Admitted to hospital with serous effusion left side of chest ; the fluid was small in amount extending up to the seventh rib. The patient had been ill for three weeks before admission to hospital. Fluid had resolved spontaneously by the thirty-first day.

Weight on admission was 110 lb. (Height 5 ft. 7 in.)

Blood-pressure was 120/80.

X-ray examination was not carried out while the patient was in hospital.

Exercise-tolerance unsatisfactory.

Patient was discharged after sixty-three days stay in hospital ; weight 127 lb.

Convalescence continued in an unsatisfactory manner with falling weight and blood-pressure, until the twelfth week, when the sputum was found to be positive.

An X-ray film of the chest taken at this time gave evidence of phthisis in the upper lobe left lung.

#### SUMMARY.

Fifty-eight soldiers who developed pleurisy while serving in Waziristan were observed for six months after the attack and it was found that seventeen of them became cases of phthisis. The diagnosis in every patient was made on microscopic evidence and was confirmed in five by X-ray evidence.

#### CONCLUSIONS.

Although the X-ray investigation was incomplete, and the period of six months' observation was undoubtedly too short, the findings of this investigation are sufficient to support the opinion that pleurisy, and particularly serous pleurisy, is a manifestation of latent tuberculosis. The follow-up scheme described above has now been adopted throughout the Indian Army ; this should assist in the earlier detection of cases of " open " phthisis and may possibly prevent the breaking down of the borderline cases.

#### ACKNOWLEDGMENTS.

I beg to acknowledge my indebtedness to Major-General W. H. Hamilton, C.B., C.I.E., C.B.E., D.S.O., K.H.P., for permission to carry out this investigation, to Lieutenant-Colonel G. B. Hanna, O.B.E., I.M.S., for permission to publish this paper, to the D.A.D.P. Waziristan District

for so much of the laboratory investigation, and to the Radiologist, Waziristan District, for the reports on the X-ray films of the patients. I should also like to thank the staff of my wards for their help.

REFERENCES.

- BOYD, W. (1935). "The Pathology of Internal Diseases. Second edition, p. 249. London: Henry Kimpton.
- COOPER, E. L. (1940). "Pulmonary Tuberculosis in Recruits," *Brit. Med. J.*, August 24, pp. 245-8.
- HORDER COMMITTEE (1940). Cited in *Brit. Med. J.*, August 10, p. 201.
- MAXWELL, J. (1938). "Introduction to Diseases of the Chest," p. 291. London: Hodder & Stoughton.
- MCCRAE, T. (1932). "Osler's Principles and Practice of Medicine," Eleventh edition, p. 664. London: Appleton Century Co.
- PRICE, F. W. (1937). "A Textbook of the Practice of Medicine," Fifth edition, p. 1244. London: Oxford University Press.
- RADMILO, Y. (1939). *Bull. Int. Services Santé*, 12, 24.
- TIDY, H. L. (1934). "Synopsis of Medicine." Sixth edition, p. 568. London: Simpkin Marshall Ltd.
- WARD E. (1940). "Recruits Suspected of Tuberculosis." *Brit. Med. J.*, June 29, p. 1067.

## THE TREATMENT OF THE SOLDIER'S FOOT.<sup>1</sup>

BY MAJOR ARTHUR J. HELFET, B.Sc., M.D., M.Ch.(ORTH.), F.R.C.S.

*Royal Army Medical Corps.*

AMONG the more important orthopædic problems in a new army is that of the feet. Large numbers of civilians, many of whom have never been subjected to severe physical strain, have now to withstand the rigours of training. Fourteen months in a Military Hospital have given us time to consider certain aspects and to determine the value of various forms of treatment. We have always aimed at simplicity of treatment.

There are three objects to consider: (1) to ensure that the recruit's feet are capable of marching twenty miles or more a day, carrying full equipment; (2) to fit every soldier's feet to the standard Army boot; (3) to decide whether various operative procedures, designed to relieve pain or deformity, will leave the soldier in Category A1.

### CLASSIFICATION.

The classification of deformities of the feet as suggested in the average textbook tends to cause some confusion. One is advised to consider four degrees of rigidity of each deformity and to apply treatment accordingly. It is simpler, however, to follow Sir Robert Jones and to ascertain whether the foot is: (i) *mobile*; (ii) *rigid*; or (iii) is in an *intermediate* stage.

*Mobile*.—If the foot is mobile, we know that the soldier may be able to—but that we certainly can—hold that foot in any position we wish. For example, a mobile flat foot can be maintained in a corrected position by a boot with a well-fitting, crooked and elongated heel. A course of suitable exercises will now enable the patient to hold this position actively.

*Rigid*.—If it is completely rigid, we know that the position cannot be altered by anything short of an operation through bone. In other words, we are faced with a fixed deformity. Treatment, therefore, is to correct deformity by operation or to support the foot in the existing position—supports being designed to prevent undue pressure on bony points.

*Intermediate*.—It is only in the intermediate stages that we are faced with a decision, viz. is it possible to mobilize the foot or not? If so, manipulation or tenotomy is performed and when the foot is mobile it is treated accordingly. If not, the foot must be allowed to become completely rigid in the optimum position, for once it is fixed it is painless, and, as mentioned before, all that is required is the protection of pressure points.

<sup>1</sup> Based on a paper given at a Meeting of the 34th General Hospital Clinical Society.

## SIMPLE FOOT STRAIN.

The feet of the majority of soldiers are *mobile* or can easily be rendered mobile. Usually, the only treatment necessary is to build up the foot to enable it to stand up to increased strain, i.e. (a) the muscles must be strengthened; and (b) the circulation of the skin improved.

(a) *Foot Exercises*.—The importance of exercising the short muscles of the foot must be emphasized. One function of the interossei, lumbricals, short flexors and extensors of the toes and the other short muscles of the foot is to straighten the toes and so form a broad platform, extending from the heads of the metatarsals forward, when walking. If these muscles are too weak or are tired they cannot do this and the toes curl. The long muscles attempt to compensate and thus increase the deformity. Weight is then taken on the heads of the metatarsals and the tips of the toes. If this is prolonged, the patient develops metatarsalgia and corns on the dorsum of the toes. The majority of the men have well-developed calf muscles which are, if anything, over-trained. They complain that pain starts in the foot and it is only after the long muscles have had to take the strain that the ache extends to the calf. Treatment must be directed primarily to strengthening the short muscles.

In this hospital, we start them on non-weight-bearing and then weight-bearing exercises for the short muscles only. Exercises are graded and always given well short of fatigue—for, if exhausted, a muscle does not develop and actually weakens. Faradism may be used with advantage.

We suggest simple exercises of the following types—each should be done six to twelve times:

*Non-Weight Bearing.*

(1) *Foot Shortening*.—The patient sits with his feet on a towel. The toes are kept extended by pressing them against the towel with the fingers. The patient then attempts to bring his heels towards his toes so that the longitudinal arch lifts slightly. The knees must be kept firmly in position and not be allowed to abduct.

(2) *Toe Raising*.—Raise toes, keeping the ball and rest of the foot firmly on the floor.

(3) *Foot Inversion*.—Keeping the knees together and the outer borders of the feet on the ground throughout the whole exercise, arch and invert until the big toes and balls of the feet touch at the mid-line.

(4) *Toe-Clawing*.—(a) With toes, claw towel into a ball under the foot; (b) lift pencil or ball of wool, etc., up with the toes.

(5) *Toe Movements*.—Put the foot on a chair so that the heads of the metatarsals and toes just extend over the edge; (a) Flex and extend the toes, resisting these movements with the fingers; (b) Spread the toes out as much as possible without flexing them or extending them. If the big toe will not abduct, hold it in abduction and ask patient to try and maintain it in this position.



(6) *Heel Raising*.—Keeping the toes extended and the ball of the foot on the ground, raise heels as high as possible.

#### *Weight Bearing.*

Exercises (1), (2), (3) and (6) should be done while standing.

(b) *Skin Circulation*.—In hospital we use all the refinements of a modern massage department to improve skin circulation. It is feasible, however, that a Field Hospital may not always have all the necessary appliances, so, in a series of cases, only twice daily contrast bathing was tried and with satisfactory results. The soldier is taught to give himself these baths. He takes two buckets of water—one as hot and the other as cold as he can stand. The feet are put into the hot water for one minute and then into the cold for half a minute. This is repeated five times. The feet are then dried vigorously with a rough towel, after which the exercises are performed. The whole treatment should take not more than twenty minutes. We have found that with this simple treatment, most feet have become strong and quite comfortable in ten days and the average case is able to return to full duty within a fortnight.

#### CALLUSES AND CORNS.

These occur only if there is undue pressure over a bony point and the treatment is to relieve pressure. Treatment of the callus or corn itself is not essential but the application of salicylic acid in collodion locally and stimulation of the skin establishes earlier foot comfort.

There are two circumstances in which they arise: (1) in the condition already described where weakness of the short muscles of the foot produces curling of the toes and throws too much weight on the metatarsal heads. The patient would complain of metatarsalgia, develop calluses under the heads of the metatarsals and later corns on the dorsum of the toes. If the deformity is mobile, weight bearing can be taken further back on the foot by applying a metatarsal bar to the boot. The bar must be at least  $\frac{3}{4}$  inch wide,  $\frac{1}{4}$  inch deep and slant across the boot immediately *behind* the tread. Physiotherapy as described under "Foot Strain" should be instituted. By the time the bar is worn out, the foot should be strong enough to do without it. If there is early rigidity of the foot, tenotomy of the extensor tendons and manipulation should precede these measures.

(2) Where there is a fixed deformity because of which the feet do not fit the boot. The commonest of these are *hallux valgus*, *hallux rigidus*, *hammer toes*, *protruding base of fifth metatarsal* and *protruding heels*. Bare-foot, they would produce no disability, but the friction of a standard boot causes pain. Being fixed deformities, only an operation performed on bone will correct them. A protruding piece of bone on the heel is removed and an unduly prominent base of fifth metatarsal is whittled down. The deformity of a *hammer toe* is corrected by wedge excision of the affected joint. Position is maintained for three or four weeks by means of a stay-suture through the extensor expansion and a collodion splint.

*Hallux Valgus*.—Many operative procedures have been described for the treatment of hallux valgus. We have found the following to be satisfactory: After a forty-eight-hour skin preparation, the proximal half of the first phalanx of the great toe is excised and the exostoses on the head of the metatarsal are removed. By means of a bandage, the toe is held in line with the inner border of the foot and slightly dorsiflexed. As we are endeavouring to produce a pseudo-arthritis, passive movements are started on the third day and are performed by the patient himself under the instruction of a masseur. After the stitches are removed on the tenth day, general foot treatment, as above described, is given. The patient is not allowed to return to duty until he has gained *active control of the movements of the great toe* and until the muscles of the foot have regained their normal strength.

*Hallux Rigidus*.—The treatment is the same as for hallux valgus. In the Army, opinion is divided as to whether it is worth while operating on hallux valgus or rigidus. It is held by some that the results do not justify treatment as the soldier will not fit into Category A1 afterwards. We take the opposite point of view as we find that most men, after the above treatment, can wear Army boots and can comfortably return to their duties in an infantry battalion.

#### FOOT CLINICS.

If large numbers of patients require treatment, the organization of foot clinics relieves congestion and facilitates the work of the massage department. In this hospital, we run one in the morning for in-patients and another in the afternoon for out-patients. The latter is attended by soldiers from nearby units. It is held in the afternoon, firstly, because we find that units can more easily release and arrange transport for their men then, and, secondly, as it enables them to perform light duties in the mornings. Besides saving the time of massage personnel, if a number of patients can be treated together, they have the added therapeutic advantages of example and competition.

I wish to thank my Commanding Officer, Colonel L. A. Harwood, T.D., for permitting, and Lieutenant-Colonel F. A. R. Stammers, Officer-in-Charge Surgical Division, for encouraging and helping me to publish this paper.

---

## Editorial.

### A NEW KIND OF SHOCK.

IN the *British Medical Journal* for March 22, 1941, there appeared an account of a phenomenon new to medical records. In an article entitled "Crush Injuries with Impairment of Renal Function," Bywaters and Beall called urgent attention to this disorder; Beall, Bywaters, Belsey and Miles described a further case; Mayon-White and Solandt gave details of still another; while six fatal cases and five ending in recovery were recorded as having been collected by the Medical Research Council Sub-Committee on traumatic œdema.

As the effects of "crush" injuries are just as likely to be met with by medical officers engaged in the rescue and care of soldiers after the bombing of houses and shelters as by their civilian brothers, it is thought well to call attention to this newly described type of casualty.

The lesion is of a curious nature and involves questions of physiology which are deeply interesting as well as very intricate.

The reason why it has not been described before is that it follows a type of injury not hitherto met with. It is part of the new "civilization," associated with an advancing science, and is directly produced, under its direction, by the brain of man.

The facts may be described as follows:

A human individual is suddenly caught under a part of his or her collapsing home. The cases described are, of course, of all ages and both sexes, a girl of 15 years old, a woman of 45, a man of 34. All are equally liable to be weighted down with masonry under the conditions necessary to produce this new kind of shock.

The pressure on limbs or trunk continues and becomes less and less endurable.

"A youth aged 17 was pinned down by three dead bodies under timber and rubble for fourteen hours." "When a bomb demolished a hostel, a young male leather worker of 20, of medium height and good physique, was buried under the debris and his left leg was crushed against the side of an iron bedstead by a heavy metal girder." These cases are typical of all the others and the crush of living tissue goes on for hours until the rescue party digs its way to where the victim is imprisoned.

The patient is then liberated and, after a period of resuscitation, appears fairly well and likely to recover. There may be no other injury than a badly contused or lacerated limb. Fracture may or may not be present. The patient, after an intravenous transfusion of plasma or serum, loses much of his shock and appears to be, on the whole, improving. The injured limb, however, has become whealed and shows marked œdema, but this,

too, tends to diminish as the first days pass. But, to the trained observer, the signs convey a different impression. The urine is ominously small in quantity and often contains a remarkable number of blood casts, or casts containing a blood-like substance. The blood-pressure is low, the hæmoglobin is raised, the urea and blood potassium are high. Everything points to a retention of certain elements in the blood stream and their suppression in the urine.

Mayon-White and Solandt describe their case as one of "limb compression ending fatally in uræmia" and this would appear to be the usual termination of severe cases though one or two appear to have got over the uræmic stage only to die of an intercurrent septic condition.

The last stage, in a majority of the cases, appears to be one of an increasing percentage of hæmoglobin in the blood, a marked increase of blood urea, and a very small excretion of smoky urine with a positive benzdine reaction. There is other evidence of blood concentration as well as that here given; an increase in the protein, an increase in the chlorides; and the blood urea totalled 770 mg. per 100 c.c. in one of the recorded cases!

The local whealing and the amount of œdema were often intense. Oscillometer readings were made in some persons and fell much below normal. The cases were evidently of extreme severity. And yet they often appeared to get much better except for the tendency to a diminished amount of urine and an intense concentration of the blood, often relieved by transfusions but coming to the front again as the effects of the addition of fluid to the blood passed off.

What was the cause?

The kidney tubules were found to contain an eosin-staining substance with some of the characters of a blood-derivative but which proved to be without free iron. Some blood was excreted as a rule. The urine was often dark and smoky and free blood cells were found in the kidney substance, while the benzdine reaction was commonly positive; but the substance forming casts and occupying the tubules, and occasionally the Bowman's capsules of the glomeruli, was different from blood, containing no free iron.

How was this accumulation in the tubules started and was it the cause or the effect of the blood concentration?

These are problems to be settled in the future when more cases come to be examined. The Medical Research Council hopes that, in any cases of this kind reported, attention will be paid to the following points:

(1) Presence of anæsthesia or whealing; (2) œdema—daily extent and progression (circumference measurement); (3) pulse in the limbs and, if possible, oscillometric readings; (4) blood pressure, initial and daily readings; (5) initial hæmoglobin measurements and biochemistry of blood (serum for potassium and urea); (6) urine, daily from time of entry, quantity, colour, and examination for blood, albumin and casts. It is hoped that our officers, if they meet cases of this kind, will collect these facts as far as possible.

In the meantime, other views have been put forward.

It has been said that the treatment was too drastic ; that the principal need of the patients is warmth and rest ; that the use of cases for the collection of data on blood-chemistry and the like is a mistake. In the *British Medical Journal* of April 19, 1941, G. S. Swan gives "A History of the Rescue and After-Care of two cases after four days' burial," and the astonishing fact is recorded that both these cases, bound down by the timbers and debris of falling houses for the period named, recovered completely after a very close approach to death. Shock, in both cases, was severe. Thirst was marked. "Urine, tested daily, revealed nothing abnormal and the output was never less than 75 per cent. of the intake." Here is seen the sharpest difference between these cases and the instances already quoted. It is clear that the effects of pressure vary within very wide limits and that 14 hours of intensely applied weight may have a more destructive effect than 101 hours of mere burial under rubble !

To us it seems that the examination of the urine for quantity, and for the presence of blood, albumin and casts, is of prime importance and that, where this excretion is much diminished, the blood chemistry also must receive the attention of the surgeon and be modified, as far as possible, by treatment.



## WELFARE AND EDUCATION.

MAJOR-GENERAL H. WILLANS, *C.B.E., D.S.O., M.C., T.D.*, Director General of Army Welfare, addressed a large audience at the Royal Society of Arts, Adelphi, London, W.C.2, on March 9, on the subject of "Army Welfare and Education." His address was a valuable one and he dealt thoroughly with his subject. Speaking of the need for welfare work—the General hates the word "welfare," which he thinks may convey to some the completely wrong idea of "Charity," but he uses it in the hope that the steady efforts of the Department may lead everyone to appreciate its true meaning—he makes it quite clear that the relief of monotony is a prime need in his organization. "I want you to realize," he says, "that boredom may be a worse enemy than the Germans; it is during periods of inaction that leadership is taxed, for it is at such times that grievances incubate and eventually emerge." It is the General's aim to give the troops "something to do and somewhere to go" in their spare time. He has therefore devoted "particular care and thought to the provision of entertainment, both live and pictorial, and to supplying men with canteens and hostels where they can feel at home and escape for the time being from the atmosphere of discipline and training." The lecture ended as follows:

"We will try to grapple with the problem, and I promise that whatever happens we will not be disheartened. As in Welfare so in Education, we must have one eye on the future when hundreds of thousands of men will clamour to be the first to return to a world which will offer a welcome only to those who are qualified and willing. Before that time comes we must fortify the soldier with the necessary technical or professional ability and educate him to the right attitude of mind. For the moment we are engaged in a life and death struggle, and the future is rightly regarded as the concern of the future, but it is never too soon to think and to plan and the knowledge that thought is being given in itself contributes to our present task of winning the war because it brings encouragement to anxious men.

"Here, then, is what we are trying to do: To keep open minds, to keep a sense of proportion, always to be on the lookout, never to be satisfied with what has been done, never to be disheartened. At least we realize the magnitude of the task that is before us, and we realize its importance; it requires no overheated imagination to see a time when morale may be more vital than tanks or aeroplanes. The responsibilities of leadership in these times are crushing, the opportunities endless. Ours is the great opportunity; we will try not to fail the men, who are the salt of the earth, any more than they will fail us."

## Clinical and other Notes.

---

### ATYPICAL SMALLPOX.

BY MAJOR P. F. PALMER,

*Royal Army Medical Corps.*

THE clinical history of Private P., 2nd Suffolks, aged 22, is as follows :—

March 22.—Patient was in his fourteenth day in hospital, undergoing malarial treatment, when in the evening, he complained of an itching rash on his neck and headache. Temperature was 99·6° F. He had no sore throat. Since the ward was closed for scarlet fever it was thought that the rash might be scarlet.

March 23.—Patient passed a normal night. Morning temperature was normal, headache and rash were still present. There was nothing to be made out on physical examination. That evening the temperature was 100·6° F., pulse 74. Headache was more severe, shivering had occurred, there was mild conjunctival injection and he now complained of backache.

March 24.—During the night he perspired freely and vomited once or twice. Morning temperature 99° F., pulse 84. The rash on the back of the neck was an angry red and irritable. In the evening headache became more severe, likewise backache ; axillary glands were tender and shotty. Evening temperature was 99·4° F., pulse 84.

March 25.—Patient passed a restless night ; copious vomiting, sweating freely. Morning temperature was 100·8° F., pulse 100. Conjunctival injection was now marked. There was photophobia, the face was swollen and suffused. There was slight pharyngeal congestion and the tongue was clean. The rash on the neck was unchanged. In addition there was slight discrete punctate erythema, in places petechial, over both groins and lower abdomen ; case thought to be of typhus group infection, i.e. fourth day rash petechial in nature, discrete palpable glands, suffused eyes and face. There was a small indurated nodule somewhat like a hard chancre on the scrotum, thought possibly to be a tick bite since the patient said that he had removed from that spot a small insect "all legs" which was stuck into his skin. He showed four very good vaccination scars of infancy. His Army Form B 178 had the entry "vaccinated 1933, modified." Blood was taken for Widal culture and Weil Felix reaction. During the day vomiting continued. Skin was dry and burning. There was slight punctate erythema on the forearms and chest and discrete papules on the palms of the hands and on the forehead somewhat deep in the skin. The petechial rash on the abdomen and glands was more marked.

March 26.—Patient passed a bad night. There was extreme restlessness and face and eyes were now congested. Tongue was dry with a slight central fur. There were a few more discrete papules. The back was clear of all rash. There was slight tremor of the hands. Morning temperature was 103·4° F., evening temperature 104·4° F. Total white-blood count was 5,700, of which 74 per cent were polymorphs. There was albumen in the urine.

March 27.—Vomiting was incessant; tongue dry and hard; rash well out, showing macules, papules and erythema. The rash on groins was more petechial; patient was restless and inclined to be delirious.

March 28.—Rash florid on face, trunk, limbs, palms and soles. Delirium continued with temperature 103° F., to 104° F. Investigations of the 25th now available. Blood culture showed Gram positive cocci on two plates.

Widal reaction :—	25.3.38.
	Ty. 70.
	A. 70.
	B. 30.
	T.O. 1/50.
Weil Felix :—	OX2 —Trace 1/25.
	OX19 —Trace 1/25.
	OXK —Trace 1/50.

White blood-count was repeated; total 14,000, of which 63 per cent were polymorphs. There was a strong odour from the patient. He said he had a sore throat and felt very ill.

March 29.—Temperature normal, following crisis during the night. There was no collapse. The patient was covered with raised papules. Some felt like buttons to touch, some showed slight umbilication, some were petechial. There was a fine granular rash, petechial in places, on the palate and the tongue. There was a large subconjunctival hæmorrhage in the left eye. The rash looked typical of smallpox. There were tender painful glands in each groin, left axilla and the back of the neck.

March 30.—Temperature 99° F. Patient showed a typical smallpox face. There were vesicles beginning on the body but the back was free from rash.

March 31.—The rash was pustular in places.

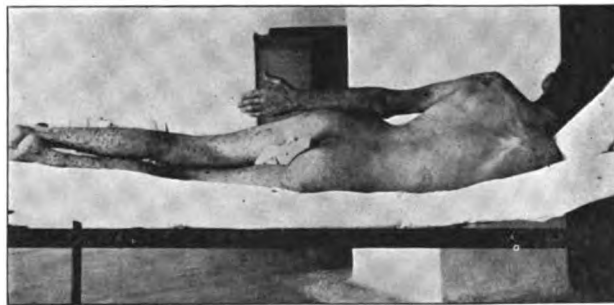
April 1.—No advance in vesiculation; if anything, vesicles smaller and beginning to be hæmorrhagic. There were deep-seated hæmorrhagic blebs on the pulp of the fingers and toes.

April 2.—Hæmorrhage occurred into all the vesicles. Case afebrile. Further history uneventful.

*Diagnosis:* The diagnosis of smallpox was not made till the typical rash appeared. Until that time the case was thought to be a typhus group infection. There seemed no reason why the case should be smallpox. The patient was well vaccinated and revaccinated and the source of infection was not obvious. The petechial character of the rash, the discrete palpable glands and suffused eyes and face, together with the story of what must have been a tick bite, and evidence of such a bite, seemed to indicate



that here was a case of typhus, definitely due to a tick bite. With this object in view the case was photographed. In the light of later events the march of the case was typical. The petechial rash on the groins was the usual prodromal triangular rash occurring in about 8 to 9 per cent of cases, to be later followed by the typical eruption beginning on the wrists and fore-



head. Had the days been counted in periods of twenty-four hours, instead of by calendar days, then the rash would be on the third evening, making it a typical third-day rash, i.e. smallpox.

The rash itself was of interest inasmuch as the development was atypical. Vesication had hardly begun before it was followed by hæmorrhage into

the pocks. In places, it will be seen from the photograph that the rash was confluent and, too, distribution of the rash was atypical on the trunk. The rash was the reverse of what usually occurs. Ker in his description of the eruption says, "even in severe cases the chest is often comparatively slightly involved and the abdomen escapes most cheaply of all. The scalp is generally much affected, as is also the back." This was not so in this case where the chest and abdomen were covered with rash and the back almost bare. A sequel of the case was the development of a winged scapula which, later, after a few months completely recovered. What the original erythema on the neck was, I do not know. It was red and angry and irritative in nature and later showed dry branny desquamation.

*Etiology* : Successful vaccination is known to confer a complete immunity for a certain number of years, probably seven to ten, and thereafter a partial immunity to the disease, meaning that, in the case of exposure to a really heavy infection, the disease can occur but will be mild and may be modified in nature. There is no doubt of successful original vaccination, since there are well marked scars, but there is grave doubt of the later revaccination. There are two possibilities to be considered : Firstly, that the second modified vaccination was a true indication of lack of complete immunity since the patient developed the disease. Secondly, that the revaccination classified as modified, was not a "take," and that complete immunity from the original vaccination had lapsed. This raises the question of the use of the term "modified" vaccination, and what is meant by such a term. It appears simpler to speak in terms of "successful" or "failed" vaccination. There is the possibility that immunity in this patient was only of a temporary nature. I myself have twice carefully vaccinated an old Quarter-master, and in both cases the vaccination failed, only to be followed by a red hot "take" after a severe attack of influenza. The possibility that failure in the first two cases was due to bad vaccine or bad technique is unlikely since the patient had been previously vaccinated very many times and had always failed to "take." This raises the supposition that protection may be temporary or may be altered by a severe illness.

*Conclusion* : A case of atypical smallpox is described in a well-vaccinated person. A winged scapula occurred as a sequela. Photographs are shown.

Permission has been kindly granted by Lieutenant-Colonel E. P. Allman Smith to send these notes for publication.

---

## HAND CARRIAGE OF WOUNDED.

BY CAPTAIN W. D. LIVINGSTONE SMITH,  
*Royal Army Medical Corps.*

A REPORT is submitted, with illustrative photographs, for favour of publication.

The rough, hilly type of ground which abounds in the North-West portion of India has struck me forcibly as very unsuitable for stretcher carriage of casualties, either by two or four bearers, the rear bearer or



FIG. 1.



FIG. 2.

FIG. 1.—Casualty in illustration has G.S. wound of right leg, dressed temporarily, and he is being supported by a S.B. ; the stretcher sling has been passed over his head, crossing behind the upper part of thighs and held out in front by casualty (or S.B.) ready to be passed over head and one shoulder of "carrying" bearer.

FIG. 2.—Carrying S.B. in position.

bearers being unable to pick their path, and causing a very rough and stormy passage for the casualty. Hand-carriage appears to be much more practical and less tiring to the bearer when crossing such country and, as it is highly desirable that the bearer should have his hands free, when necessary, I advocate this method, using one or more stretcher slings. The type of transport put forward is just a modification of that used by Eastern troops when the sling is placed across the forehead. Our troops, entirely unaccustomed to such strain on the neck, find this practically

impossible, while passing the sling across the bearer's chest, as illustrated, produces the same results and is much less tiring to the bearer.

One point I would like to stress is that the actual loading of the bearer is not primarily intended to be self attained. It is much easier if another bearer assists and makes minor adjustments, if necessary, so as to ensure maximum comfort to casualty and bearer. The latter can rest during a long carriage by returning to a position illustrated approximately in Fig. 3.



FIG. 3.



FIG. 4.

FIG. 3.—Casualty leans forward and allows tension on sling to be taken up. Bearer is about to rise to his feet, being assisted, if necessary, by assistant bearer, who is supporting casualty. If casualty is unconscious or unable to use his hands, the front straps of his webbing can be attached to webbing of carrying bearer to ensure his position as illustrated.

FIG. 4.—Bearer in standing position with casualty in pick-a-back position. Bearer's hands are free, if necessary, and his right hand can be used to immobilize injured leg of casualty.

## REPORT ON A CASE OF MULTIPLE INJURIES.

BY CAPTAIN M. J. G. FURNELL,  
*Royal Army Medical Corps.*

SIGNALMAN D. W., aged 22, a despatch rider, crashed into the back of a lorry in the blackout. I did not see him before he died, but non-medical witnesses stated that he died within ten minutes of the accident.

The body was seen by another Medical Officer just after death, and by me for the first time on the next day, when I was present at the autopsy performed by Dr. Peter Milligan, M.B., M.R.C.P., Honorary Pathologist to Doncaster Royal Infirmary, by whose kind permission I am reporting this case.

There were no external signs of injury beyond a few grazes on the chin and no bones broken anywhere. Some bloodstained froth was exuding from the nostrils and mouth and there was a considerable quantity of blood in the nasopharynx. There was no damage to the skull nor was the brain affected. There was a small hæmatoma under the aponeurosis covering the anterior surface of the sternum towards its lower end, but, apart from this, no damage could be found to any of the bones or muscles of the chest wall. There was an extensive right hæmothorax due to two large tears in the right lung, one near the hilum and the other on the parietal surface of the lower lobe. Both lungs were riddled with hæmorrhages varying in size from petechiæ to areas of a couple of inches in diameter. They also showed acute pulmonary cedema with much pink froth in the bronchi. There was a large hæmo-pericardium due to rupture of the wall of the right auricle. There were many petechial hæmorrhages and several larger ones, up to the size of a florin, in the pericardium, endocardium and myocardium. There was a tear 3 inches long inside the left auricle, just above the mitral valve, involving the myocardium but not completely rupturing the wall.

A large right retroperitoneal hæmorrhage was also present and the right kidney contained hæmorrhages of all sizes.

The injuries were apparently caused by the sudden compression and re-expansion of a young and elastic chest wall. A similar force would probably have fractured the ribs and sternum of an older subject.

The interest of this case seems to me to be : (1) That such extensive internal injuries can be caused without any apparent external damage and even in the absence of any fracture of a bone. (2) The similarity of the injuries to the lungs to those sustained in injuries from blast, as reported in the *British Medical Journal* recently (January 18, 1941, Hadfield and Christie, p. 77, and elsewhere in the same issue).

---

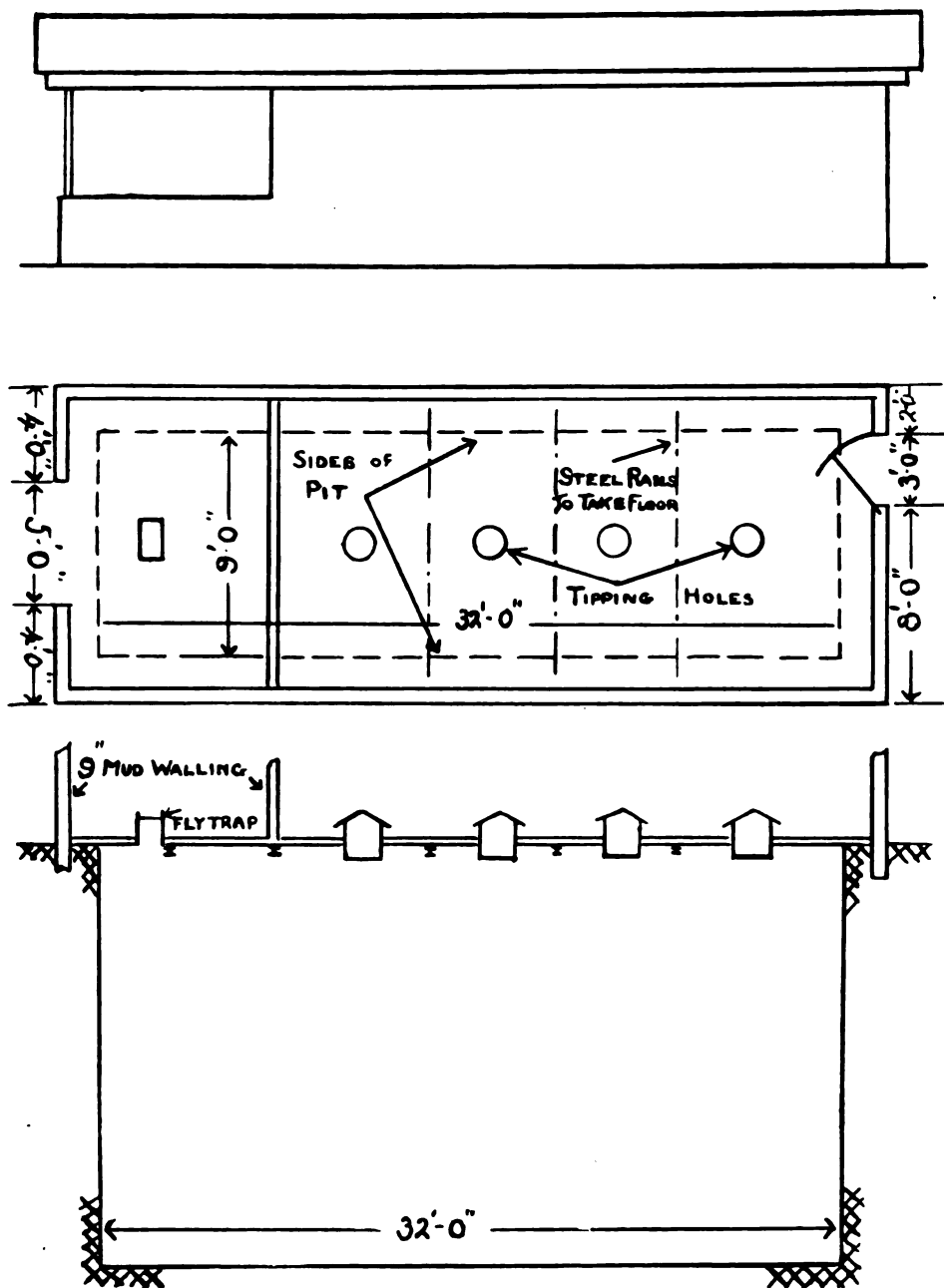
### SOME NOTES ON AN IMPROVED TYPE OF OTWAY PIT.

BY MAJOR W. J. ROBERTSON,

*Royal Army Medical Corps.*

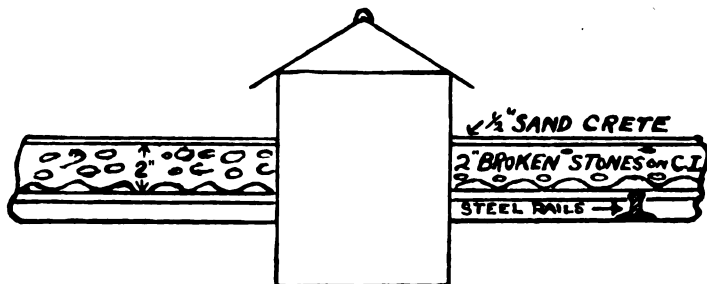
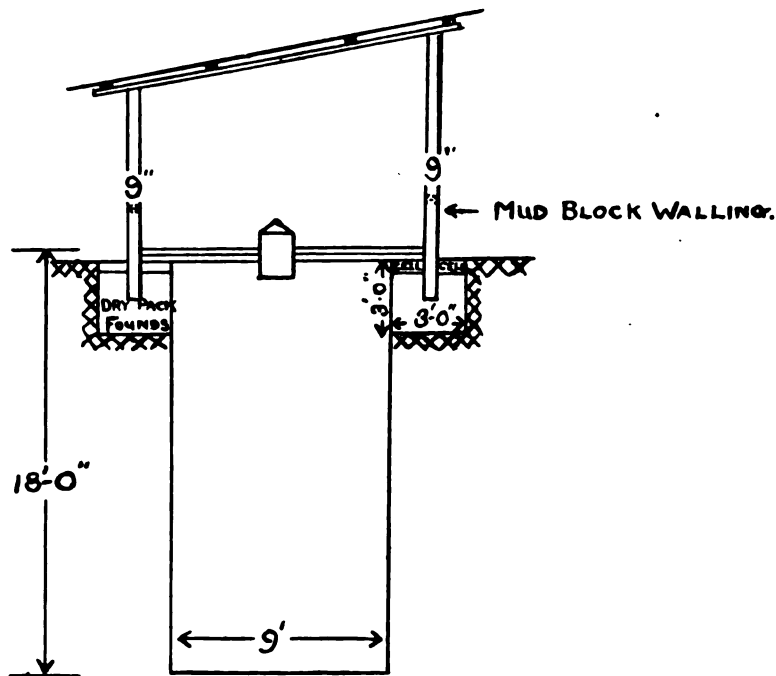
WHEN Freetown was reopened as a station for Imperial troops, a new barracks mainly for African gunners was built. The question of the disposal of excreta arose and as dry earth closets are the general practice here, it was decided to construct Otway Pits of the pattern used by the Civil Health Department. This is a modification of the Otway Pit, and was

IMPROVED TYPE OF OTWAY PIT.



worked out by P. Osment, Sanitary Superintendent, Health Department of Sierra Leone (late a/Q.M.S., R.A.M.C.).

This is certainly a most simple and effective method of dealing with the excreta of a moderate-sized community and would appear suitable for camps, etc.



The pit is excavated 18 feet deep, 32 feet long and 9 feet wide. Such a size has been found capable of dealing with the excreta of a community of 300 for approximately two years.

Lengths of old steel rails are used to support the floor, which is made

of C.I. sheets surmounted by 2 inches of broken stones and covered with  $\frac{1}{2}$  inch of sandcrete (washed sand 8 to cement 1). Sandcrete is used as being easier to break up than concrete when the pit is filled.

Around the top edge of the pit dry pack founds are made supporting 9-inch mud-block walls, all made from the soil of the pit. Facing the walls with sandcrete increases their durability. Such walls are 12 inches from the pit edge and the floor extends all round to meet them. At the fly trap end of the pit apertures are left in the walls to admit light. One wall is made slightly higher than the other to permit of a sloped roof made of corrugated iron on wooden battens with an overlap of 12 to 18 inches on each side. Corrugated iron roofing, although more expensive, is much more efficient than thatching with palms or reeds, as this latter type of roof very soon becomes pervious and causes scouring of the floor and edges of the pit.

Old sanitary dustbins are used as tipping holes but, instead of one, as is usual in this type of pit, four are provided at equal intervals down the length of the filling portion. It has been found by experience that, with only one filling hole, usually situated at the end of the pit, the excrement does not find its own level but banks and the pit appears to be filled when actually not more than half full.

With the improved pit, filling is done through the nearest hole until the mass rises to floor level, when No. 2 hole is taken into use, and so on till the mass reaches the floor by No. 4 hole. At this stage it will be found that some settling has taken place and the cycle can be repeated from No. 1 hole.

The fly trap used is the normal type made from a kerosine box with roof and trap of mosquito wire. Such traps are easily and cheaply made and can be immediately replaced as they become unserviceable through termites, exposure, etc.

When a pit is full it remains in that condition for twelve months, after which time an opening can be made around one of the filling holes and the matured contents removed. To facilitate removal one or more C.I. sheets may be taken from the roof. After emptying the floor and roof are replaced and the pit is again ready for use. There is in this Colony a keen demand for the matured contents for flower gardens.

A pair of such pits used as described will last for twenty years or longer.

A stand pipe is erected adjacent to the pits with a hose and nozzle attached so that latrine buckets can be washed on the site and the washings emptied into the pit. This addition of water to the pit has the action of making it into a form of septic tank. It is undesirable to use cresol in the latrine buckets in this system, as the cresol destroys the bacteria and interferes with the maturing of the pit contents. Sawdust or dry earth to cover the faeces is the best method.



## Current Literature.

---

MEDICAL RESEARCH COUNCIL. INDUST. HEALTH RESEARCH BOARD.  
**Industrial Health in War. A Summary of Research Findings  
 Capable of Immediate Application in Furtherance of the National  
 Effort. Emergency Report No. 1.** pp. iv + 28. 1940. London :  
 H.M.S.O. [6d.]

The issue of this report is opportune when a tendency is growing to forget the lessons learnt in the last war, viz. that human beings are not machines of which the output is steady however many hours they are kept going. Indeed, many cases are quoted of output being greatly increased by reducing the over-long hours insisted upon. It is foolish extravagance to pay for work done during incapacity from fatigue. Misguided efforts to stimulate workers to feverish activity in the supposed interests of output are as useless as would be the cheers of partisans encouraging a long-distance runner to a futile sprint early in the race. The remedy for fatigue is rest ; otherwise energy's reserve capital is called upon. Over-long hours should be avoided and also continuous work without intervals for rest. Sunday rest and ordinary holidays should be given. Alleviate boredom by varying work or even providing such a distraction as music. Cut out unnecessary movements and effort at repetition processes. Increases in sickness-absence, in accidents and in labour wastage are danger signals. The importance of good lighting to vision is stressed ; the standards which should be maintained are stated. The chief requirements for satisfactory heating and ventilation are summarized, having regard always to maximum efficiency at different processes. The majority of accidents result from factors under personal control ; experienced workers have far fewer accidents than newcomers. The best workers have less lost time and fewer accidents than inferior workers. Inexperienced workers require supervision. Machines should be run at regular and optimum speeds. Those "accident-prone" should be placed upon safe work. Records must be kept of all lost time and of labour wastage. Efficiency goes with good health, both bodily and mental. Discontent is a thief of output. Much, indeed, is known ; and the need for the moment is rather for application of knowledge previously gained than for new research.

E. L. COLLIS.

*Reprinted from "Bulletin of Hygiene," Vol. 15, No. 8.*

---



---

<sup>1</sup> This abstract is of special importance at the present time.

## Reviews.

---

**CEREBROSPINAL FEVER.** By Denis Brinton, D.M.Oxon, F.R.C.P.Lond.  
Edinburgh: E. and S. Livingstone, 1941. Pp. vii + 163. 4 Plates.  
Price 8s. 6d. net.

The author explains in his preface that this account of cerebrospinal fever was written owing to the "need for a small book in which the whole subject was briefly reviewed and the essential features of the new treatment were simply stated."

The book contains nothing that is new and the treatment described is that which has been followed by the great majority of practitioners since the present greatly increased incidence of the disease began at the end of 1939. The clinical types of cerebrospinal fever are dealt with as fully as the treatment of the disease, and the publication will be of value in further emphasizing the need for early diagnosis and the immediate exhibition of a suitable preparation of the sulphonamide group of drugs. There can be little doubt that the continued education of the profession on these two points has done much to reduce still further the mortality rate of cerebrospinal fever as compared with six months ago. It is to be hoped that this improvement will continue.

The early part of the book is concerned with the epidemiology, ætiology and pathology of the disease. It is unfortunate that the author has relied for much of his information on the literature produced as the result of experiences during the 1915-18 outbreak. It is not suggested that the observations recorded were not correct but the generalizations that followed many of these observations have not been confirmed by work carried out more recently. The overcrowded barrack-room, the carrier rate and the incidence of the disease was the triangle on which all discussions on cerebrospinal fever were based. Investigations undertaken during the last ten years have failed to demonstrate any definite relationship between the bed spacing of barrack-rooms, the carrier rate and the incidence of the disease. Experiences of the present outbreak bear this out fully.

The book contains a great deal of useful clinical information but the method of presentation is not good. It is frequently difficult to appreciate the exact meaning the author wishes to convey. For instance, at the beginning of page 21 the predisposing influence of infections of the upper respiratory passage on the incidence of cerebrospinal fever is denied yet at the foot of the same page it appears to be fully accepted as an important factor.

H. J. B.

THE PHARMACOLOGY AND THERAPEUTICS OF THE MATERIA MEDICA.  
Sixteenth Edition (Revised). By Walter J. Dilling, M.B., Ch.B.  
London: Cassell & Company, Ltd. 1940. Pp. x + 602. 12s. net.

The fact that this small volume has passed through sixteen editions and twenty-three reprints since its first publication fifty-six years ago is sufficient testimony to its continued popularity.

The present edition appears to have been brought well up to date and includes the new pharmacopœial names, recently published by the British Pharmacopœia Commission, for drugs, many of them previously manufactured under patent by enemy countries and described under registered trade names but now manufactured by British firms.

The general format of the book as well as the pabulum appear excellent but I have some minor criticisms to offer concerning a few of the newer drugs mentioned.

Pamaquin (plasmoquine) is stated to be effective in benign tertian and quartan malaria. Our experience, a fairly extensive one, is that plasmoquine, alone, has little effect on either of these two infections during the *acute phase*, and, on this account, should never be used as a substitute for quinine or atebirin, either of which is effective during the acute attack. The chief therapeutic virtues of plasmoquine lie, firstly, in its effective action on the gametocytes of all forms of malaria, secondly, in its dramatic effect on the relapse rate, especially of benign tertian and quartan malaria. In other words, plasmoquine is a poor schizonticidal drug but an effective gametocidal remedy, whereas quinine and atebirin are exactly the reverse.

The dose of plasmoquine recommended, 0.06 g. daily for four to seven days, is rather higher than that now considered safe or advisable and, if followed, would probably result in a crop of minor toxic by-effects. Of the two important toxic side-effects observed during medication with plasmoquine, namely, colic and cyanosis due to methæmoglobinæmia, only the latter is mentioned.

No mention is made of certuna (cilional), closely allied to plasmoquine, but stated to be less toxic and more effective.

Writing of mepacrine hydrochloride (atebirin) the author states that "in urgent cases it can be given intravenously (0.3 g.) in 5 mls of normal saline." This method of administration is not recommended even by the manufacturers. Most physicians prefer atebirin for injection (mepacrine methanesulphonate) given by intramuscular injection deep into the muscles of the buttock. Absorption into the blood stream is almost as rapid by this as by the former route and it is far safer.

A note of caution should be sounded in future editions on the danger of administering plasmoquine and atebirin concurrently or mixed in the same pill. There is solid evidence to show—although some authorities disagree—that if given together the toxic effects of each are greatly enhanced. Our experience definitely supports this view.

In the section dealing with quinine and malaria mention is made of only

three species responsible for the latter infection in man, viz., *Plasmodium vivax*, *P. malariae*, and *P. falciparum*. *P. ovale*, causing a form of benign tertian malaria, is now generally conceded as a fourth species.

The mature, bursting, malaria trophozoite is usually called a mature schizont and not a merocyst.

Dealing with the selective action of quinine on the malaria parasite the author remarks: "Statements that quinine is most actively toxic to the spores and therefore need only be in maximum concentration in the blood at the moment of sporulation are of theoretical interest but not of practical utility." Most of us who have had extensive experience in the treatment of malaria will support this view, although there are physicians, mostly of the older school, who withhold quinine until a certain stage in the malaria attack in order that the maximum concentration of the drug may be reached in the blood stream at the optimum moment. In our opinion the practical disadvantages envisaged in this method of exhibiting quinine far outweigh its theoretical possibilities, especially if large numbers of patients are under treatment, when it is all important that the drug be given at regular and definite intervals throughout the day at times suited to nursing requirements rather than to phases in the cycle of the infecting parasite, commencing as soon after the disease is diagnosed as possible.

The author recommends following the normal five to seven day course of quinine by a further course of the drug, in reduced dosage (10 grains daily), for two to three months. An alternative method, sponsored by the Malaria Commission of the League of Nations (4th General Report published in 1937), is to treat the primary attack with quinine in full dosage (30 grains daily) for five to seven days. Further medication is then stopped unless or until relapses occur when each relapse is treated on its merits as for the primary attack. Still another method, especially useful in hyperendemic foci of the disease or where for any reason it is imperative that individuals should be kept on their feet and out of hospital, is to follow the normal seven-day course of quinine by the drug in much reduced dosage (six grains daily) throughout the period that the individual is at risk. In this case the small daily dose of quinine acts as a clinical (but not causal) prophylactic.

In the section dealing with the treatment of malignant tertian malaria it is not, perhaps, sufficiently stressed that cerebral malaria constitutes a grave medical emergency and requires somewhat heroic measures if the patient's life is to be saved. Quinine, given by intravenous injection, is generally considered to give the patient his best chance; other methods of administration are too slow and uncertain.

Mention is made of quinine-resisting forms of malaria. There is very little evidence that such exist (at least, not in the sense of arsenic-resisting trypanosomes in sleeping sickness). Failure of a malaria attack to respond to quinine can usually be attributed to some other cause, usually within the competence of the patient or his physician to remedy. Amongst these may be mentioned: sophistication of the quinine product used—a common

source of trouble in India ; failure to take the drug on account of its bitter taste or of its reputation as " gut rot " ; faulty absorption due to gastritis, constipation, etc. Tanret's test for the presence of quinine in the urine is a valuable bedside guide to absorption and is well worth mentioning in a future edition.

Writing of emetine in the treatment of amœbiasis Dr. Dilling recommends half-grain doses thrice daily by hypodermic injection for ten days ; rather a " corvée " for the patient and seldom necessary, except possibly for the first few doses in an exceptionally severe case. A kinder and effective routine method is to administer daily injections, each of 1 grain, for twelve consecutive days. The injection of emetine locally into a liver abscess after aspiration of the pus is not now usually employed ; reliance being placed on daily hypodermic injections.

Emetine bismuth iodide is usually given in one dose of 2 to 3 grains at night with the patient lying comfortably in bed. If there is nausea or a tendency to vomit, a single dose of luminal, 1 grain, or 10 mm. of laudanum may be given half an hour before.

The section dealing with sulphanilamide and its derivatives appears up to date and in most respects satisfactory.

Mention could, with advantage, be made of the paramount necessity of the proper spacing of the drug—four-hourly day and night—during the early phases of an acute infection.

Intrathecal injections of sulphonamide drugs are not usually advised in the treatment of meningococcal meningitis nor is sulphanilamide usually regarded as effective in the treatment of pneumococcal meningitis (Type III infections excepted).

Referring to sulphapyridine the author states that a daily dosage of 12 to 16 g. is required to maintain the bacteriostatic action. This may be so, but the above dosage is somewhat heroic and a larger daily dosage than 8 to 9 g. (exceptionally, 10 g.) is rarely recommended.

A note dealing with yellow fever and typhus vaccines might with advantage be added to the section on vaccines.

The book is well put together and the printing is good, an important item these days when a proportion of one's reading may have to be done in an air raid shelter with indifferent lighting.

S. S.

**VENEREAL DISEASES.** By E. T. Burke, *D.S.O.*, M.B., Ch.B.Glas. London : H. K. Lewis & Co., Ltd, 1940. Pp. xv. + 549. Price 30s. net.

The increased interest which venereal disease has aroused as a result of war conditions, more particularly in the Services, is alone sufficient to guarantee a welcome to " Venereal Diseases " by E. T. Burke. This book is extremely well produced and its outstanding features are the really beautiful coloured plates and photographs. To a reviewer who holds views on many important points diametrically opposed to those of the author, fair criticism is almost impossible ; perhaps the fairest way is to point out

that, though many of the views propounded are hardly in accord with general opinion, they are at least ingenious and provide much food for thought ; not only that, they *make* the reader think. A study of the theory and practice of " efficiency indices " may well give the budding venereologist a headache whilst the statement that the gonococcus is *never* intra-cellular (p. 335) is calculated to upset the equanimity of the most level-headed pathologist.

This is a stimulating book full of wise clinical observation, more suitable for the fireside armchair than the busy V.D. treatment room.

ESSENTIALS OF GENERAL ANÆSTHESIA, WITH SPECIAL REFERENCE TO DENTISTRY. By R. R. Macintosh, M.A., M.D., F.R.C.S., D.A., and Freda B. Pratt, M.D., D.A. Oxford : Blackwell Scientific Publications, Ltd. 1940. Pp. xi + 334. Price 25s.

This is an instructive, well written and exceptionally well illustrated work of some 300 pages.

Though primarily concerned with general anæsthesia for dental purposes, nevertheless the principles of general anæsthesia for general surgery are sufficiently indicated. As the title suggests, no attempt is made to deal with local, regional or spinal anæsthesia, or to discuss the many anæsthetic techniques used in general surgery.

In most works on general anæsthesia the space devoted to anæsthesia for dental operations is not large and, in this respect this book, dealing as it does with this branch of general anæsthesia in great detail, fills a definite gap in the literature.

The history of general anæsthesia is not long but even so contains the seeds of controversy ; the book opens with an eminently fair and full account which agrees with the known facts.

The authors favour the oxygen deprivation theory of anæsthesia, i.e. that the phenomena of anæsthesia are due to anoxia. They do not, however, accept nitrous oxide as simply an oxygen replacer but postulate that it should be regarded as a mild inhibitor of one of the enzymes in the process of cell oxidation.

The chapters on respiration and cyanosis are welcome features. Too many professional men embark on the administration of inhalational anæsthesia with only the vaguest ideas of the physiology and physico-chemistry of the respiration or the true meaning of cyanosis, e.g. an anæmic patient under a general anæsthetic may die of anoxæmia without showing cyanosis.

Most anæsthetists will support the authors' contention that the average physician is singularly unhelpful in deciding the choice of anæsthetic in doubtful or poor risk cases and that the proper person to consult in such cases is preferably a second anæsthetist. The authors illustrate this contention with four cases from their own experiences.

Pre-anæsthetic medication is fully dealt with, as is the subject of general

anæsthesia for children. The authors prefer to recognize a *status periculosus* rather than a *status lymphaticus*. This postulates an idiosyncrasy to the depressant effects of an anæsthetic drug rather than a pathological entity.

As regards the vexed question of deaths from chloroform in the early stages of chloroform anæsthesia, the authors attribute these to ventricular fibrillation caused by the liberation of the patients own adrenalin into the blood-stream in susceptible subjects. No reference is made to vagal stimulation in high vapour concentration.

The induction and maintenance of anæsthesia with nitrous-oxide given nasally is dealt with very fully. Endotracheal anæsthesia is fully discussed and well illustrated. The emergencies that may arise in the course of general anæsthesia administered for dental operations are dealt with in detail.

Tracheotomy is discussed and well illustrated, and an instructive book closes with a chapter on the legal responsibilities of the anæsthetist.—

J. M. S.

**A TEXTBOOK OF BACTERIOLOGY FOR DENTAL STUDENTS. Second Edition.**

By Arthur Bulleid, L.R.C.P.Lond., M.R.C.S., L.D.S.Eng. London: William Heinemann (Medical Books), Ltd. 1938. Pp. xviii + 207. Price 15s. net.

This textbook should prove an invaluable asset to dental students and practitioners alike. It portrays bacteriology, as far as they are concerned, in a concise and well classified form and obviates the necessity of wading through large textbooks on general bacteriology.

Chapters XI to XIV are of particular interest to practitioners and to students attached to General Hospitals as the importance of a detailed knowledge of the bacteriology of dental lesions cannot be stressed too much and especially those showing active pus formation with inevitable toxic absorption.

The technique for the preparation of dental smears and cultures is well tabulated, simple, and embraces everything necessary to ensure good results.

This book should undoubtedly put a new outlook on the field of oral bacteriology and, as a work of reference, prove a very valuable asset owing to its concise and, at the same time, highly explanatory nature.

J. W.

## Correspondence.

---

TO THE EDITOR OF THE " JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

MY DEAR CUMMINS,—Despite stresses, I feel that I must make an effort to secure a little more adequate recognition of the national value of the wonderful services rendered by the late Sir William Horrocks during our last war. Tributes have been paid in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS to his qualities and to his services as its editor, but no adequate reference has been made to his contributions to our victory in the field. It is because that omission is probably due to the fact that no other survivor shares my intimate knowledge resulting from working directly under his orders that I feel impelled—in justice to his memory—to bring those services to the notice of the R.A.M.C. as it mourns the passing of one of its most distinguished scientists.

I propose to illustrate his great practical services in two special directions only.

*Firstly*, as regards the Army water cart, I note that it was on the day after the outbreak of war, and hence just in time, that I completed to Sir William's satisfaction the efficiency tests of the design and action which he had perfected with characteristic thoroughness. My final test showed that water bacterially contaminated even to the extent of opalescence was sterilized by half an hour's routine exposure to chlorine in our water cart, as controlled by use of the " Horrocks Test-box " later so familiar to British troops.

It is impossible accurately to allocate credit among the factors which almost eliminated enteric from our forces during the last war, but this application of scientific methods to water purification in the field undoubtedly contributed to the reduction of enteric from the high level of our previous wars. At the rate obtaining in the South African war, for example, enteric would have cost us about 200,000 lives in the war of 1914-18, whereas it actually caused the death of only 204 of our troops in France.

*Secondly*, as regards his even more important and successful services when upon the Royal Army Medical Service was thrown the task of devising means of protecting our field forces against poison-gas. While such work might have perhaps more reasonably have devolved upon the R.A. Ordnance Corps, it was indeed fortunate for the Army and the country that Sir William was available and ready to undertake that vital duty.

The success which attended our efforts of scientific initiative, for which he bore the main responsibility, was largely attributable to his remarkable ability to improvise organizations to meet such new and unexpected needs. His capacity for rapid organization was illustrated by the speed of our response to the surprise of the Germans' initial gas-attack at Ypres : although the chemical antidote had to be chosen and purchased and the



textiles bought, cut, stitched, dipped, dried and sent overseas, 160,000 protective pads had been distributed to our front-line troops within sixty hours—a truly wonderful achievement. Before the “Great War” ended no less than 55,000,000 respirators of various kinds had been made, largely to his specifications.

In the light of such evidence it is perhaps not too much to claim that but few individual officers contributed more of practical value and applied science to our victory of 1918 than did Sir William Heaton Horrocks.

*University of Edinburgh,*

Yours, etc.,

*Usher Institute of Public Health,*

P. S. LELEAN.

*Warrender Park Road.*

*April 12, 1941.*

## NOTES ON THE MEDICAL SERVICES OF A DIVISION.

TO THE EDITOR OF THE “JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.”

DEAR SIR,—Reference the Article “Notes on the Medical Services of a Division,” in the March number of the Journal. I would be obliged if you will make the following corrections in the Text :

Page 130, line five, for “show” read “know.”

Page 134, line six, for “D.P.s” read “D.R.s”

Page 134, para. seven, should read, “With the present equipment . . . defensive positions, that are not going lightly to be permitted to fall into enemy hands, the A.D.S. should be . . .” etc.

The substance of these notes was prepared in July and August, 1940, and a considerable delay occurred after submission for censorship before they were printed in the Journal.

Since August, 1940, a considerable modification in the tactical handling of a Field Ambulance has taken place. This is most particularly marked in the Subdivision of the Companies into sections.

Many of the remarks in the article should therefore be read in conjunction with this change in tactics. The basic principles remain the same and I am convinced that the Section principle is a sound one. It is to be hoped that the scheme of forming Sections of the Field Ambulances, for close liaison with the infantry battalions is the germ of the idea of making the Field Ambulance a true evacuating unit and that the process of evolution will result in the introduction of more vehicles to enable us, having collected our casualties, to evacuate them with the utmost speed to the place where their injuries can receive the treatment they so urgently need.

I would be obliged if you can see your way to publishing this apologia for the apparent “out of dateness” of some of the remarks in the article referred to above.

*Headquarters 44 Division,*

Yours, etc.,

*Home Forces.*

J. C. DOWSE,

*April 11, 1941.*

*Colonel.*

## Notices.<sup>1</sup>

---

### COD-LIVER OIL AS A DRESSING.

THE British Cod-Liver Oil Producers (Hull), Ltd., call our attention to a paper read by Dr. John Steel, Medical Superintendent of the Smithdown Road Hospital, Liverpool, on the use of this oil as a dressing. Dr. Smith points out that the *pure* oil, not the crude preparation, should be used. Amongst other points in its favour he speaks as follows :—" My experience of pure cod-liver oil as a dressing is that it has a marked effect on specialized tissues which more than compensates for the scent, the almost pus-like exudate, and the exuberant granulations. In addition, it reduces pain (and, in my opinion, consequent shock), allows redressings to be done with a minimum of pain, and the end-result shows the least scar-formation of any dressing I know."

---

### ROCHE PRODUCTS LTD.

WE are informed that Roche Products Limited, Welwyn Garden City, Herts, have opened branch offices at 166, Buchanan Street, Glasgow, C.1, where, for the convenience of Scottish customers, a full range of " Roche " preparations will be carried.

---

### THE PREVENTION AND TREATMENT OF INFECTION IN WOUNDS BY SULPHONAMIDES.

WE have received from Pharmaceutical Specialities (May and Baker), Ltd., a valuable report on " The Prevention and Treatment of Infection in Wounds by Sulphonamides " which, while too long to include as such, is to be warmly recommended to all dealing with such injuries.

The available data, clinical and experimental, concerning the value of the local implantation of sulphonamides in the prevention of wound infection are reviewed. There is evidence that the local implantation of a sulphonamide may prevent, or contribute to the prevention of, primary infection. Implantation should be followed by oral administration, for which purpose sulphanilamide, sulphapyridine or sulphathiazole may be used. Implantation should not be carried out for wounds involving nerve tissue. While sulphapyridine has been suggested by some writers for implantation and has actually been used in this way, it appears that its appropriateness for the purpose ought to be established by experimental investigations, followed, if necessary, by clinical trials.

---

<sup>1</sup> These notices are for the purpose of acquainting officers with the latest developments in therapeutics, but do not imply that the preparations mentioned have been added to the list of authorized drugs.

The implantation of sulphanilamide or other sulphonamide will be of little or no value in heavily infected wounds where the administration of an appropriate sulphonamide drug on the recognized line is required.

---

#### PERCALIN AND MERSALYL.

WE have received from Messrs. Evans Sons Lescher & Webb, Ltd., notices of two new preparations: "Percalin," a concentrated solution of calcium in organic combination for intravenous or intramuscular use in the various disorders for which calcium is usually prescribed; and "Mersalyl," a substance put out as a 10 per cent solution for infection, buffered with 5 per cent of Theophylline, and as suppositories.

Mersalyl solution is said to be indicated in cardiac disorders complicated by œdematous conditions and may be administered concurrently with other cardiac stimulants.

---

#### IODOXYL AND INJECTION PHENOBARBITONE.

MESSRS. EVANS SONS LESCHER & WEBB, LTD., send us particulars of two of their latest preparations.

(1) Iodoxy (Evans) is a stable, aqueous, 75 per cent solution of Iodoxy B.P. Chemically, iodoxy is the di-sodium salt of N-methyl-3:5-di-iodo-4-pyridone-2:6-di-carboxylic acid, and is a white, odourless powder containing 51.5 per cent of iodine.

*Dosage.*—Adults, 20 c.c. intravenously. Children, 10 c.c. intravenously. Infants, 3 c.c. intravenously.

(2) Injection Phenobarbitone (Evans) is a solution of Phenobarbitone B.P. in a special non-toxic solvent. Each ampoule of 1.5 c.c. contains 0.2 gramme (3 grains) Phenobarbitone B.P.

*Dosage.*—The average adult dose is 1 c.c. injected intramuscularly. Must not be injected intravenously. Children should be given a proportionate dose.

---

#### "TABLOID" AMMONIUM CHLORIDE—SPECIAL COATING.

A RECENT introduction by Burroughs Wellcome & Co., of "Tabloid" Ammonium Chloride—Special Coating, permits larger doses of Ammonium Chloride to be taken than otherwise would be the case if ordinary sugar-coated products were used. Local irritation to the stomach lining is prevented by this special coating which remains unaffected by the acid media of the stomach but breaks down in the alkaline media of the small intestine. The combined special coating and sugar coating of "Tabloid" Ammonium Chloride will resist the action of the stomach juices for a period of from three to four hours, complete disintegration taking place in the small intestine.

# JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

## Corps News.

MAY, 1941.

### EXTRACTS FROM THE "LONDON GAZETTE."

His Majesty The KING has been graciously pleased to approve the under-mentioned awards in recognition of gallant and distinguished services in the field:

#### *The Distinguished Service Order.*

Lieutenant James Morton Muir, M.B. (128242), Royal Army Medical Corps.

The KING has been graciously pleased to approve of the undermentioned awards, in recognition of distinguished services in the field:

#### *The Distinguished Conduct Medal.*

No. 7516742 Private Laurence Arthur Coe, Army Dental Corps.

The following awards have been made in recognition of distinguished services in the Middle East during the period August, 1939, to November, 1940.

#### *O.B.E. (Military Division).*

Lieut.-Colonels (Temporary Colonels) F. G. A. Smith and Q. B. V. Wallace, *M.C.*; Lieut.-Colonel J. Melvin, *M.C.*; Majors (Temporary Lieut.-Colonels) A. O. Bekenn and J. M. Macfie, *M.C.*, R.A.M.C.

#### *M.B.E. (Military Division)*

Lieut. (Acting Captain) G. Lorrimer and Lieut. H. R. Hartnell, R.A.M.C.

#### MENTIONS IN DESPATCHES.

Colonel (Acting Major-General) P. S. Tomlinson, *D.S.O.*, and Colonel J. C. Sproule, *O.B.E.*, late R.A.M.C.; Lieut.-Colonel (Acting Colonel) H. Alcock, Lieut.-Colonel D. C. Scott, *O.B.E.*, Major (Acting Lieut.-Colonel) W. A. D. Drummond, Major (Temporary Lieut.-Colonel) F. R. H. Mollan, *M.C.*, Captain (Local Lieut.-Colonel) R. P. Cormack, Lieut. (Temporary Major) D. M. Blair, Captains J. MacMillan and J. B. M. Milne, and Lieuts. G. Geddes and J. B. Heycock, R.A.M.C.

*March 18.*—Col. (temp. Brig.) O. W. McSheehy, *D.S.O.*, *O.B.E.*, M.B. (15664) (late R.A.M.C.), to be a Dep. Dir. Medical Servs. and is granted the actg. rank of Maj.-Gen. Mar. 1, 1941.

*March 21.*—The undermentioned, at their own request, revert to the rank stated whilst empld. during the present emergency:

As Majs.:

Lt.-Col. R. J. Franklin (5463), ret. pay, R.A.M.C. Feb. 18, 1941.

*March 25.*—The undermentioned retire on ret. pay:

Maj.-Gen. J. W. L. Scott, *C.B.*, *D.S.O.*, K.H.P. (5437) (late R.A.M.C.). Mar. 26, 1941.

Col. A. N. R. McNeill, *D.S.O.*, M.B., V.H.S. (10753) (late R.A.M.C.). Mar. 26, 1941.

Col. (actg. Maj.-Gen.) O. W. McSheehy, *D.S.O.*, *O.B.E.*, M.B. (15664) (late R.A.M.C.), to be Maj.-Gen. Mar. 26, 1941.

Lt.-Col. T. O. Thompson, D.M. (4850), from R.A.M.C., to be Col. Mar. 26, 1941, with seniority Aug. 27, 1938.

Col. S. W. Kyle, M.B. (5068), ret. (late R.A.M.C.), to be a Dep. Dir. of Medical Servs., and is granted the actg. rank of Maj.-Gen. Mar. 26, 1941.

Maj. R. McKinlay, M.B. (8719), to be Lt.-Col. Mar. 26, 1941.

*March 28.*—The undermentioned Capts. (temp. Majs.) to be Majs.:

N. P. Breden, M.B. (53103). Mar. 11, 1941.

C. M. Marsden, M.B., F.R.C.S. Edin. (53104). Mar. 15, 1941.

P. T. L. Day (51344). Mar. 25, 1941.

*April 4.*—*Short Service Commission.*—Capt. W. L. O'Donnell (90092), relinquishes his commn. on account of ill-health. Apr. 5, 1941.

*April 8.*—Capt. (temp. Maj.) F. K. Bush, M.B. (52041), to be Maj. Apr. 7, 1941.

*April 11.*—The KING has been graciously pleased to approve the following appointments:

*To be Hon. Surgeons to The King.*—Col. (temp. Brig.) C. M. Finny, *O.B.E.*, M.B., F.R.C.S. (8132) (late R.A.M.C.), Dec. 26, 1940 (vice Col. B. Biggar, M.B., F.R.C.S. (68833) (late R.A.M.C.) retired).

Col. (Actg. Maj.-Gen.) (now Maj.-Gen.) O. W. McSheehy, *D.S.O.*, *O.B.E.*, M.B. (15664) (late R.A.M.C.), Mar. 1, 1941 (vice Maj.-Gen. F. D. G. Howell, *C.B.*, *D.S.O.*, *M.C.* (8026) (late R.A.M.C.) retired).

*To be Hon. Physician to The King.*—Maj.-Gen. J. A. Manifold, *D.S.O.*, *M.B.* (9044) (late *R.A.M.C.*), Mar. 26, 1941 (vice Maj.-Gen. J. W. L. Scott, *C.B.*, *D.S.O.* (5437) (late *R.A.M.C.*) retired).

*Short Service Commission.*—Lt. (on prob.) J. E. Miller (163133), is confirmed in his rank. Mar. 19, 1941.

*April 15.*—Lt.-Col. (temp. Col.) D. C. Monro, *M.B.*, *F.R.C.S.* (Edin.), *K.H.S.* (14493), from *R.A.M.C.*, to be Col., Mar. 26, 1941, with seniority July 1, 1938.

Maj. & Bt. Lt.-Col. (temp. Lt.-Col.) A. E. Richmond, *O.B.E.* (9946), to be Lt.-Col. Mar. 26, 1941.

Capt. (temp. Maj.) E. S. Tweedy, *M.B.* (53065), to be Maj., Apr. 15, 1941.

Col. A. C. H. Gray, *O.B.E.*, *M.B.* (10101), ret. pay (late *R.A.M.C.*), at his own request, reverts to the rank of Maj. whilst empld. during the present emergency. Mar. 26, 1941.

## Regular Army Reserve of Officers.

### GENERAL LIST.

*March 28.*—Col. J. B. Grogan (4782) (late *R.A.M.C.*), having attained the age limit of liability to recall, ceases to belong to the Res. of Off. Sept. 20, 1940.

*April 1.*—The undermentioned having attained the age limit of liability to recall, cease to belong to the Res. of Off.:

Maj.-Gen. H. Ensor, *C.B.*, *C.M.G.*, *C.B.E.*, *D.S.O.*, *M.B.* (Col. Comdt. *R.A.M.C.*) (9805). Mar. 20, 1941.

Col. C. J. Wyatt, *M.B.* (15106) (late *R.A.M.C.*). Oct. 8, 1940.

*April 11.*—Col. A. E. S. Irvine, *D.S.O.* (11037) (late *R.A.M.C.*), having attained the age limit of liability to recall, ceases to belong to the Res. of Off. Apr. 11, 1940.

*April 15.*—The undermentioned cease to belong to the Res. of Off. on account of ill-health. Apr. 16, 1941:

Lt.-Col. I. R. Hudlestone, *D.S.O.* (50542).  
Capt. C. W. Simpson, *M.B.* (38216).

## THE ARMY DENTAL CORPS.

*March 21.*—Maj. C. E. Day (31210), h.p. list, retires, receiving a gratuity, on account of ill-health. Mar. 4, 1941.

*April 4.*—Capt. W. A. O. Roe (45095), to be Maj., Mar. 25, 1941.

## QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

*March 28.*—The undermentioned Sisters resign their appts.:

Miss A. W. Elwood. Feb. 20, 1941.

Miss A. Saxby. Mar. 31, 1941.

The undermentioned Staff Nurses to be sisters:

Miss J. F. McA. Brims, Nov. 14, 1940, with seniority next below Miss M. J. Baird.

Miss E. M. Talbot, Feb. 1, 1941, with seniority next below Miss E. F. Shine.

*April 8.*—The undermentioned Staff Nurses to be Sisters:

Miss A. M. Baker, Feb. 1, 1941, with seniority next below Miss E. F. Shine.

Miss R. M. N. Mansel. Feb. 16, 1941.

Miss W. Wright. Mar. 1, 1941.

*April 11.*—Staff Nurse Miss L. M. Dobbin to be Sister, Jan. 10, 1941, with seniority next below Miss F. J. Parry.

## ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

In some recent notes, we mentioned a variety of ways in which money has been raised for the Guild. We have now to add that in one military district our friends organized a most successful dance, the resulting profit of £112 making a very welcome addition to our funds. We should like again to express our thanks to the organizers.

There is now a badge issued to members of recognized Working Parties through the Director of Voluntary Organizations at a cost of 6d.

The Honorary Secretary has arranged to obtain a number of these badges, and will

send them to the organizers of Working Parties for the Guild for issue to members.

The conditions upon which the badges are issued are as follows:

"The badge certifies that the wearer is a regular voluntary worker under the National Scheme, and that he or she has rendered service to the country for a period of not less than three months, and is still continuing work.

"Any worker purchasing a badge shall sign an acknowledgment to include an undertaking to cease to wear the badge on ceasing to perform regular work."

The badge is a brooch in attractive red

enamel, with the words "For the Forces" underneath, and surmounted by a lion in silver.

As the supply of badges is limited, an early application with Postal Order is desirable.

Address requests to the Honorary Secretary, R.A.M.C. and A.D. Corps Comforts Guild, R.A.M.C. Headquarters Mess, Millbank, S.W.1.

### NOTICE.

The Annual General Meetings of the R.A.M.C. Fund and the R.A.M.C. Officers' Benevolent Society will be held at the R.A.M.C. Headquarter Mess on Monday, June 9, 1941, commencing at 2 p.m.

### KILLED IN ACTION.

**BIRD.**—In France, on June 18, 1940, Lieutenant Donald Alfred Bird, R.A.M.C., attached to 1st East Surrey Regt. Born in Canada Dec. 19, 1914, he took the

L.R.C.P., L.R.C.S. Edinburgh, and the L.R.F.P.S. in 1939. He had only taken a short service commission in the R.A.M.C. on Sept. 1, 1939, as Lieutenant.

### DIED OF WOUNDS.

**FERRO.**—On Mar. 19, 1941, Captain Anthony Alfred Ferro, R.A.M.C. Born in Malta, June 14, 1914, he was educated at Malta University, where he graduated M.D. in 1937. He entered the R.A.M.C., on Oct. 27, 1937, and was promoted Capt. Oct. 27, 1938.

**McKILLOP.**—On June 11, 1940, Lieutenant John Murdock McKillop, R.A.M.C. Born Mar. 3, 1914, he was educated at Glasgow University where he took the M.B., in 1938. He was commissioned as Lieutenant R.A.M.C. on Sept. 14, 1939.

### DEATHS.

**RUSSELL.**—On Jan. 12, 1941, Major-General John Joshua Russell, *C.B.*, late R.A.M.C., Retired. Born Sept. 26, 1862, he was educated at Trinity College, Dublin, where he graduated M.B. in 1885. Gazetted Surgeon July 28, 1886, he became Major R.A.M.C. July 28, 1898, Lieutenant-Colonel July 28, 1906, Colonel Mar. 1, 1915, and Major-General Feb. 7, 1918. He retired Feb. 7, 1922. He served in the South African War in Cape Colony, being awarded the Queen's Medal with Clasp and the King's Medal with two Clasps. He served in France from Aug. 5, 1914, till Feb. 1918, at first in command of 5 General Hospital and later as an A.D.M.S. and a D.D.M.S. Thrice mentioned in despatches he was awarded the *C.B.*, 1914 Star, British War and Victory Medals.

till Sept. 9, 1920. Mentioned in despatches in the *London Gazette* of July 10, 1919, he was awarded the 1914 Star and Clasp, British War and Victory Medals.

**LOWE.**—On Feb. 20, 1941, Captain William Edmund Lowe, Quartermaster R.A.M.C. Retired. Born April 28, 1869, he enlisted Jan. 28, 1889. He served 18 years and 246 days in the Ranks and 6 years 207 days as a Warrant Officer. Gazetted Quartermaster and Hon. Lieutenant April 26, 1914, he was promoted Hon. Captain July 1, 1917, and retired April 28, 1924. He served in France from Aug. 18, 1914,

**CLARKE.**—In Rathfarnham, Co. Dublin, on Mar. 4, 1941, Colonel Thomas Henry Matthews Clarke, *C.M.G.*, *C.B.E.*, *D.S.O.*, late R.A.M.C., Retired. Son of Staff Surgeon Thomas Henry Matthews Clarke, Colonel Clarke was born in Nassau, Bahamas, on June 15, 1869 and educated at Trinity College, Dublin, where he graduated M.B. in 1895. Commissioned Surgeon Lieutenant Jan. 28, 1897, he served in the operations in Crete in 1898 taking part in the affair of Sept. 6, 1898, in which he was wounded, leading a sortie to the rescue of a wounded man; half the sortie party being killed or wounded. Colonel Clarke was mentioned in despatches and awarded the *D.S.O.* He was promoted Captain Jan. 28, 1900, and seconded whilst his services were placed at the disposal of the High Commissioner of Crete from Jan. 14, 1901, till Nov. 22, 1903. Personal Physician to Prince George of Greece 1900—1903 he was appointed a Knight of the Order of the Saviour (Greece) and in 1903 created *C.M.G.* He was the

author of "Sanitary Work in Crete"; "Blue Book, Turkey, No. 1"; and "Pre-historic Sanitation in Crete," *British Medical Journal*, 1903. Promoted Major Jan. 28, 1909, he became Lieutenant-Colonel Mar. 1, 1915, Colonel Jan. 27, 1918, and retired Feb. 1, 1920. He served in France in 1915—1916, being mentioned in despatches and awarded the *C.B.E.*, 1914-15 Star, British War and Victory Medals.

**PRIESTLEY.**—In Yateley, Hants, on Mar. 16, 1941, Lieutenant-Colonel Harold Edgar Priestley, *C.M.G.*, R.A.M.C. Retired. Born Jan. 24, 1879, he was commissioned Lieutenant R.A.M.C. July 31, 1905; Promoted Captain Jan. 31, 1909, Major Oct. 15, 1915, and Lieutenant-Colonel Mar. 30, 1930. Placed on half pay on account of ill-health Feb. 1, 1932, he retired on account of the same, Aug. 20, 1932. He proceeded to France Aug. 18, 1914, and became prisoner of war. He was one of the six R.A.M.C. Officers who volunteered to take up at Wittenberg Camp, the duties abandoned by the German Medical Staff. The conditions in this camp during a rigorous winter were appalling. The men's overcoats according to Mr. Justice Younger's Committee had been taken from them on their capture. Many were without boots and socks—having their feet wrapped in straw. Colonel Priestley found them gaunt, of a peculiar odour and verminous. No communication was permitted with the outside; the food was passed in for the hospital on a trolley worked by winches at either end over twenty yards of rail to avoid all contact with the outer world. The food for the camp was pushed in over chutes. Three of the six R.A.M.C. officers died. Colonel Priestley was left with health impaired. He was mentioned in despatches for devotion to duty and valuable services rendered during epidemics of cholera and typhus in the camp and created *C.M.G.* He was awarded the Gold Life Saving Medal of the Order of St. John of Jerusalem. He was thanked by the Army Council for his valuable report on the camp. The Army Council also expressed their appreciation of his devotion to duty. At the end of 1916 he was employed on the Hospital Ship "Britannia" and mentioned in despatches for valuable services rendered on the occasion of sinking of hospital ships. He served in Egypt in 1917. He received the 1914 Star and Clasp; the British War and Victory Medals.

**MCCLOGHRY.**—In South Africa on Mar. 18, 1941, in South Africa Captain Charles Edward McCloghry. Born Nov. 11, 1912, he graduated M.B., Belfast, in 1936. Gazetted Lieutenant (Short Service Commission) R.A.M.C. April 23, 1937, he was promoted Captain April 23, 1938.

**MIDDLETON.**—Colonel Edward Meredyth Middleton, late R.A.M.C., who was killed by enemy action Mar. 20, 1941, was a well-known officer of the Royal Army Medical Corps. An attractive genial personality, yet when he felt a certain course was right he had the courage of his convictions. Well versed in the administrative problems of the Army, those under him always realized that the welfare of the soldier was safe in his hands. He was interested in all forms of sport. His loss will be much felt by a large circle of officers in and out of the service. Eldest son of the late Rev. F. E. Middleton, M.A., Rector of Haynford, Norfolk, he was born there Oct. 10, 1880. Educated at St. Thomas's Hospital and Toronto University, he graduated M.B., Toronto, 1895 and took the M.R.C.S.Eng. and the L.R.C.P.Lond. in 1906. Entering the service as Lieutenant R.A.M.C. Jan. 28, 1907, he was promoted Captain July 28, 1910, Major Jan. 28, 1919, Lieutenant-Colonel Sept. 6, 1931, and Colonel Sept. 26, 1935. He retired Oct. 10, 1937, and was appointed Officer-in-charge Reception Station at Chiseldon. On the outbreak of war he rejoined and was appointed an A.D.M.S. In the war of 1914-1921 he proceeded to France on Aug. 14, 1914, and was unfortunate enough to be taken prisoner on Aug. 24, 1914. He returned to England June 29, 1915, and subsequently served in Macedonia and with the Egyptian Expeditionary Force in Palestine. Twice mentioned in despatches he was awarded the *O.B.E.*, 1914 Star and Clasp, British War and Victory Medals.

A correspondent writes:

"The acute sensibility to events of sadness is inclined to be dulled at a period such as this when recurring tragedy is of daily occurrence. Nevertheless the death by enemy action of Colonel E. M. Middleton will come as a shock and engender a feeling of grievous loss amongst his many friends in the Corps. It is hard to believe that so virile and cheerful a character is no longer with us.

"To be known by a nickname is more often than not a real indication of popularity. 'Fruity' Middleton was no exception to this rule. He was held in high esteem and was deservedly popular in the Corps he had faithfully served for thirty-four years. His was a sanguine and cheerful temperament that made him friends wherever he might be; he was essentially a good 'mixer.' During the last war the writer shared with 'Fruity' the unpleasant experience of one year in a prison camp in Germany. The breadth and depth of a man's character was searched in such circumstances. It is sufficient to say that the writer's affection for him was deepened at the end of what seemed to be an interminable incarceration.

"One recalls the badinage between 'Fruity' and an equally popular officer of the Corps of the same term when they came to discuss the respective merits of various 'batches' of officers. They were both equally vociferous in declaiming that 'our batch' surpassed all others that had gone before, or was likely to follow. Indeed, it can be truly said that 'Fruity' Middleton's personality did much to justify the intentional extravagance of their description of its merits.

"It required little exercise of the imaginative faculty to picture 'Fruity' cheering those around him by his composure and nonchalance before a crashing bomb sped his generous soul to eternity. Whilst mourning his death his many friends will be gladdened by having known him."

**BEACH.**—In Reading on April 3, 1941 Colonel Thomas Boswall Beach, *C.M.G.*, *C.B.E.*, late *R.A.M.C.*, Retired. Colonel Beach was a son of the Rev. Canon Beach, *M.A.*, *C.F.* Born in Brompton, May 28, 1866, he was educated at Bloxham and King's College, London. At Bloxham he was Head Prefect, played in the school cricket eleven and took several prizes. He obtained 2nd Class honours in the Senior Cambridge Local Examination. At King's College he obtained a Warneford Entrance Scholarship and a further Warneford Scholarship for Resident Students. He took prizes for Divinity (1st year), anatomy, materia medica, surgery, clinical medicine, with Todd, Jelf and Warneford Medals. He was Dresser and Clerk to Lord (then Sir Joseph) Lister and Clinical Clerk to Dr. (afterwards Sir David) Ferrier. He took the *L.R.C.P.* and *M.R.C.S.*, London, in 1889. One of a number of able men who elected to join the Army Medical Service in the early nineties, he passed second into Netley and first out, winning the Herbert Prize and Montefiore Medal. Commissioned Surgeon (his batch was the last batch to be gazetted Surgeon) Jan. 31, 1891, he became Major Nov. 29, 1900 (special promotion for service in the South African War), Lieutenant-Colonel Mar. 10, 1912, Colonel Mar. 1, 1915, and retired Dec. 27, 1919. He received the thanks of the government of India for his services during a very severe outbreak of cholera at Lucknow in 1896. He served in the South African War taking part in the advance on Kimberley including actions at Belmont, Enslin, Modder River and Magersfontein. He was present at the operations at Paardeberg, actions at Poplar Grove, Dreifontein, Vet River and Zand River, actions near Johannesburg, Pretoria and Diamond Hill and action at Belfast. Mentioned in despatches and specially promoted Major he was awarded the Queen's Medal with seven Clasps and the King's Medal with two Clasps. In the

war 1914-21 he served in Egypt and with the Egyptian Expeditionary Force, as *S.M.O.*, *A.D.M.S.* and *D.D.M.S.* Twice mentioned in despatches he received the *C.M.G.*, *C.B.E.*, 1914-15 Star, British War and Victory Medals. Since retirement he had lived at Reading with his mother and sister, interesting himself in work on the management of the Royal Berkshire Hospital and also taking much interest in local sporting matters. He had been in indifferent health most of the time since his retirement; these trying conditions he endured with very great fortitude and he was cheery and companionable to the last. Going through life, contributing to the happiness of others largely by his urbanity and good humour, he has left a host of friends fortunate in having served with one of his mental and professional calibre.

**O'FLAHERTY.**—On Apr. 8, 1941, in Westward Ho, Lieutenant-Colonel Austin Romuald O'Flaherty, *R.A.M.C.*, Retired. Born in Killarney, Feb. 7, 1870, he took the *M.R.C.S.*, *L.R.C.P.*, London, in 1901, having taken the *L.S.A.* in 1897. Commissioned Lieutenant July 27, 1898, he was promoted Captain July 27, 1901, Major Apr. 27, 1910, Lieutenant-Colonel Mar. 1, 1915, and Retired Mar. 30, 1921. After retiring he practised in Devon and was an Ex-President of the North Devon Branch of the British Medical Association. He served in Sierra Leone in 1898-1899, receiving the Medal with Clasp. He was, in 1899, mentioned for showing considerable pluck in assisting to quell a disturbance at Panguma, Sierra Leone. In 1900 he was the means, through his judgment and tact and self reliance, of suppressing a very serious quarrel which would have led to a serious loss of life between the West African Regiment and Frontier Police at Panguma. For this he received the thanks of Governor and Council. He was in South Africa in 1902, being awarded the Queen's Medal with three Clasps. From Feb., 1916, till the end of the war in 1918, he served in Mesopotamia. Twice mentioned in despatches, he received the British War and Victory Medals.

**FIGG.**—At Southampton, on Apr. 10, 1941, Major Charles Arthur Figg, *O.B.E.*, Quartermaster, *R.A.M.C.*, Retired. Born Sept. 3, 1874, he enlisted May 3, 1893. He served in the ranks 17 years, 172 days; as a Warrant Officer 3 years, 294 days, and was in possession of the Long Service and Good Conduct Medal. Commissioned Quartermaster and Hon. Lieutenant Aug. 12, 1914, he was promoted Hon. Captain Aug. 12, 1917, and Major Aug. 12, 1929. He retired Sept. 3, 1929. "Charlie" to his friends, he was one of the best known



and deservedly popular officers, both commissioned and non-commissioned, in the Corps. All who served with him were impressed with his upright character and sterling qualities. As company Staff Serjeant at the Depot he was brought into immediate contact with all ranks of the Corps and had a marked influence on the recruits under his charge. He served in the South African War, taking part in the Defence of Ladysmith, the actions at Laings Nek and Belfast. He received the Queen's Medal with three Clasps and the King's Medal with two Clasps. He served in France from Aug. 1914 till the end of the war. Thrice mentioned in despatches he was granted the next higher

rate of pay and awarded the *O.B.E.*, 1914 Star, British War and Victory Medals.

**KAVANAGH.**—On Apr. 19, 1940, Lieutenant-Colonel Edward James Kavanagh, *D.S.O.*, *M.C.* Born Nov. 5, 1881, he graduated *M.B.* at the Royal University of Ireland in 1906, and was gazetted Lieutenant, *R.A.M.C.* July 30, 1906. Promoted Captain Jan. 30, 1910, and Major July 30, 1918, he retired with the rank of Lieutenant-Colonel July 30, 1926. He served in France and Belgium from Aug. 18, 1914, till the end of the war, being mentioned in despatches thrice. He was awarded the *D.S.O.* in 1918, the *M.C.* in 1915, 1914 Star, British War and Victory Medals.

#### EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc., which should be in duplicate if possible according to King's Regulations.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a *nom-de-plume*.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps," will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications and of twenty-five excerpts in the case of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, A.M.D.5, Hobart House, Grosvenor Place, S.W.1."

#### MANAGER'S NOTICES.

The Annual Subscription for the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is £1 payable in advance. Single copies, 2s. 6d. per copy.

Cheques, etc., should be made payable to the "Journal R.A.M.C.," and crossed "Holt & Co."

Communications in regard to subscriptions, change of address, etc., should be addressed "THE MANAGER, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, A.M.D.2, Hobart House, Grosvenor Place, S.W.1."

#### ADVERTISEMENTS.

Communications regarding Advertisements should be addressed—  
G. STREET & CO., LTD., 8, SERLE STREET, LONDON, W.C.2.

84.6 1.7516



and deservedly popular officers, both commissioned and non-commissioned, in the Corps. All who served with him were impressed with his upright character and sterling qualities. As company Staff Serjeant at the Depot he was brought into immediate contact with all ranks of the Corps and had a marked influence on the recruits under his charge. He served in the South African War, taking part in the Defence of Ladysmith, the actions at Laings Nek and Belfast. He received the Queen's Medal with three Clasps and the King's Medal with two Clasps. He served in France from Aug. 1914 till the end of the war. Thrice mentioned in despatches he was granted the next higher

rate of pay and awarded the *O.B.E.*, 1914 Star, British War and Victory Medals.

**KAVANAGH.**—On Apr. 19, 1940, Lieutenant-Colonel Edward James Kavanagh, *D.S.O.*, *M.C.* Born Nov. 5, 1881, he graduated *M.B.* at the Royal University of Ireland in 1906, and was gazetted Lieutenant, *R.A.M.C.* July 30, 1906. Promoted Captain Jan. 30, 1910, and Major July 30, 1918, he retired with the rank of Lieutenant-Colonel July 30, 1926. He served in France and Belgium from Aug. 18, 1914, till the end of the war, being mentioned in despatches thrice. He was awarded the *D.S.O.* in 1918, the *M.C.* in 1915, 1914 Star, British War and Victory Medals.

### EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc., which should be in duplicate if possible according to King's Regulations.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a *nom-de-plume*.

All Communications or Articles accepted and published in the "*Journal of the Royal Army Medical Corps*," will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications and of twenty-five excerpts in the case of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS*, A.M.D.5, Hobart House, Grosvenor Place, S.W.1."

### MANAGER'S NOTICES.

The Annual Subscription for the *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS* is £1 payable in advance. Single copies, 2s. 6d. per copy.

Cheques, etc., should be made payable to the "*Journal R.A.M.C.*," and crossed "*Holt & Co.*"

Communications in regard to subscriptions, change of address, etc., should be addressed "THE MANAGER, *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS*, A.M.D.2, Hobart House, Grosvenor Place, S.W.1."

### ADVERTISEMENTS.

*Communications regarding Advertisements should be addressed—*

G. STREET & CO., LTD., 8, SERLE STREET, LONDON, W.C.2.

۱۷۱۶















































































































































































































































72









